FINAL SYNOPSIS OF THE PROPOSED THESIS

TO BE SUBMITTED FOR THE Ph.D.

(COMMERCE) DEGREE OF MANGALORE UNIVERSITY

Title of the Thesis

AN EMPIRICAL STUDY OF LIVELIHOOD PATTERN OF CIVIC EMPLOYEES ENGAGED IN SOLID WASTE MANAGEMENT IN DAKSHINA KANNADA DISTRICT

Researcher

Bhagyashree R

REG NO: 181141306

Research Scholar

Department of Post-Graduate Studies and Research in Commerce,

Mangalore University

Mangalagangothri-574199

Karnataka, India

Research Guide

Dr. Preethi Keerthi Dsouza

Associate Professor and Chairperson

Department of Post-Graduate Studies and Research in Commerce,

Mangalore University

Mangalagangothri-574199

Karnataka, India

OCTOBER 2024

TABLE OF CONTENTS

Sl. No.	Title	Page No.
1	Introduction	1-11
2	Literature Review	11-18
3	Statement of the Research Problem	18-19
4	Research Questions	19
5	Objectives of the Study	19
6	Hypotheses of the Research	20-23
7	Conceptual Model of the Study	23
8	Research Methodology	23-30
9	Scope of the Study	30-31
10	Significance of the Study	31
11	Limitations of the Study	31-32
12	Chapter Scheme of the Study	32-33
13	Major Findings of the Study	33-46
14	SEM model	46-47
15	Suggestions	47-57
16	Directions for Future Research	57-58
17	Conclusion	58-60
18	References	60-66

LIST OF TABLES

Table No.	Title	Page No.
1	Cronbach's Alpha reliability coefficient	26
2	Construct validity test for principal component analysis	27
3	Population and sample size of the study	30
4	Primary reasons for employees' entry into SWM identified using Principal Component Analysis	42
5	Chi-squared test results for the impact of employment types on working conditions	43
6	Fisher's exact test results for the impact of employment type on Challenges faced by employees	44
7	Association between Working Conditions and Livelihood Sustainability of respondents	45
8	Association between Alternative Livelihood Strategies and Livelihood Sustainability of respondents	45
9	Association between External Support System Access and Livelihood Sustainability of respondents	46
10	Fit indicators of SEM	47
11	Regression Weights: (Group number 1 - Default model)	48
12	Standardized Regression Weights: (Group number 1 - Default model)	48
13	Interpretation for the variables in the SEM model	49

LIST OF FIGURES

Table No.	Title	Page No.
1	The Sustainable Livelihood Framework of the Department for International Development	6
2	Asset Pentagon of the Department for International Development's Sustainable Livelihood Framework	7
3	Conceptual model of the present research study	23
4	Structural Equation Modelling model	47

ABBREVIATIONS AND ACRONYMS

ALS	Alternative Livelihood Strategy
DFID	Department for International Development
DK	Dakshina Kannada
ESS	External Support System
FCS	Financial Capital Sustainability
H0	Null hypothesis
H1	Alternative hypothesis
HCS	Human Capital Sustainability
HS	Highly Significant
NCS	Natural Capital Sustainability
MSWM	Municipal Solid Waste Management
OBC	Other Backward Classes
PCS	Physical Capital Sustainability
PCA	Principal Component Analysis
PIP	Policy Institution and Process
PPE	Personnel Protective Equipment
SC	Scheduled Caste
SCS	Social Capital Sustainability
SEM	Structural Equation Model
SL	Sustainable livelihood
ST	Scheduled Tribes
SW	Solid Waste
SWM	Solid Waste Management
TNUSSP	Tamil Nadu Urban Sanitation Support Programme
ULB	Urban Local Body
UNDP	United Nations Development Programme
WC	Working Condition

1 INTRODUCTION

India is one of the fastest developing economies in the world, where industrialization and economic consolidation serve as key indicators of development. The surge in industrial and economic activities has driven urbanization, leading to a higher concentration of people in cities, and consequently, an increase in waste generation in urban areas. According to a World Bank report, the urban population of India during the year 1960 constituted 17.9 per cent of the country's total population which rose to 35.39 per cent in the year 2021 and it is projected to rise to 40.1 per cent by the year 2030 and 52.8 per cent by 2050 it is also indicates for the first-time urban population would exceed rural. Hence rise in population would lead to a rise in the generation of waste.

1.1 Municipal solid waste management (MSWM)

The complex nature of waste management requires a thorough understanding of its sources, types, and potential ecological impacts. Waste is categorized based on various factors, including physical characteristics, and states, sources of generation, biodegradability, reusability, and environmental impact. The most widely accepted categories of waste include solid waste, liquid waste, and gaseous waste (Amasuomo & Baird, 2016). **Solid waste (SW)** is a mixture of non-liquid materials, generated from domestic/household, agricultural, trade, commercial, industrial, mining, construction, and other public services (Sasikumar & Krishna, 2009). The portion of SW that is produced from everyday human activities excludes biomedical waste and industrial hazardous waste is commonly referred to as **municipal solid waste** (Sasikumar & Krishna, 2009).
Management of municipal solid waste (MSW) is a key responsibility of local bodies in India. The local bodies' responsibility toward MSW encompasses a series of activities such as planning, financing, constructing, and operating facilities for waste collection, transportation, recycling, and disposal (Annepu, 2012). Whereas the government plays a leading role in setting regulations and providing fiscal support to the proper functioning of MSWM systems, the actual execution of MSWM-related tasks is undertaken by these local bodies. They either manage the service directly or opt for a public-private partnership (PPP) model to enhance the efficiency of waste management operations.

1.2 Employees engaged in municipal solid waste management

The success of the MSWM system depends heavily on four key aspects: waste-related policies, resource availability, the attitude of waste producers, and, more crucially, the performance of employees involved in waste management. The employees hired by urban local bodies to handle solid waste management-related tasks are known as **civic employees engaged in solid waste management** or **solid waste management workers** or **sanitation workers**. They are also referred to as 'Paurakarmikas' in Kannada language and 'Safaikarmacharis' in Hindi language.

As urbanization and economic development increase, these employees need to play numerous roles within the waste management sector, on which they depend primarily for their livelihood. Through their responsibilities, they continuously strive hard to uphold environmental standards and safeguard public health. Their responsibilities encompass a wide range of tasks including waste collection, transportation, treatment, and disposal, all of which are inherently dangerous due to the high exposure to hazardous materials and conditions. Their lives are continuously under pressure from frequent health exposures and social stigmatization (Patil & Raje, 2020**;** Lenka, 2019**;** Pandey, 2011)

A serious question that arises while looking at employees engaged in SWM is despite their contributions to the environment and human wellbeing, whether these employees earn a decent livelihood, enjoy favourable working conditions, and enjoy sustainable livelihoods or do their vital roles help them in improving their living conditions or get them recognition?. All these queries regarding these employees can be answered with a comprehensive livelihood study.

1.3 Livelihood

Literature shows that most studies on livelihood adopt the definition given by Chambers and Conway, 1992, which remains one of the most concise and meaningful. Livelihood is described as the capabilities, resources (both material and social), and activities necessary to sustain a means of living (Chambers & Conway, 1991). It can be derived from a range of activities that people engage in, including both farm and off-farm activities that together offer a range of procurement strategies for food and cash (CARE, 2000).

Livelihood, in simple terms, refers to the means or methods of making a living, encompassing a wide range of activities beyond formal agreements or specific trades. It is not solely dependent on income from a particular employment but also includes various assets and entitlements (Chambers & Conway, 1991).

1.4 Livelihood pattern

The livelihood pattern explains how individuals sustain their lives through activities and strategies. It examines the interplay of various factors, including socio-demographic characteristics, resources, challenges, strategies, and external support systems (Afrin & Islam, 2021). It describes a person's livelihood activities, asset profile, challenges, and strategies (Ali et al., 2008). The present study considered the term 'livelihood pattern' to describe the asset-holding pattern of MSWM employees, as well as their activities, strategies, and challenges to make a sustainable living.

1.5 Sustainable Livelihood

According to Chambers and Conway, sustainable *livelihood is a circumstance where livelihoods can withstand and recover from stresses and shocks while preserving or improving its resources and capabilities both in the present and in the future without harming the natural resource base* (Chambers and Conway, 1992). Sustainable livelihoods not only support current well-being but also expand it, ensuring a secure and promising livelihood for future generations. A livelihood without sustainability is considered transient, where benefits such as income, well-being, or resources cannot be maintained in long-term (Das, 2019). Therefore, sustainability is essential to ensure that livelihoods remain stable and continue to fulfill people's needs over time.

Livelihood sustainability is indicated by individuals' secure access to resources, activities, assets, and reserves and their ability to manage potential risks effectively. It represents a situation where the available resources and assets are sufficient to meet immediate needs, accumulate wealth and protect against future uncertainties (CARE, 2000).

1.6 Theoretical framework of the research

To measure the livelihood sustainability of individuals, various approaches are developed. These livelihood approaches guide the analysis of the complexities of

people's livelihoods and how they make a living, especially for the poor or vulnerable, in both rural and urban settings (Serrat, 2017). The Sustainable Livelihood approach helps examine people's strengths, weaknesses, objectives, opportunities and difficulties (Krantz, 2001). Hence, the study uses the 'Sustainable Livelihood Approach' to comprehensively analyse the livelihood sustainability of civic employees engaged in solid waste management.

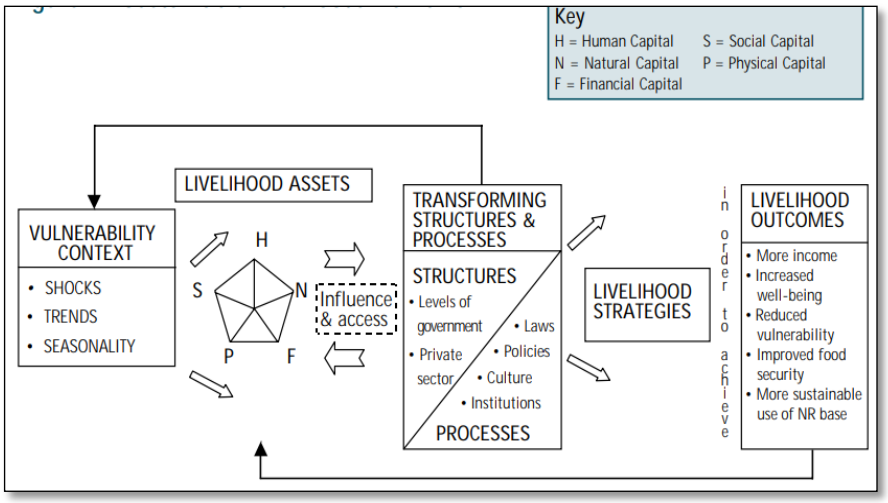
The core of the Sustainable Livelihood approach is the sustainable livelihood framework, which serves as a key tool for livelihood analysis. Its strong people-centred orientation has made it widely accepted among researchers to analyse the livelihoods of people (Divakarannair, 2007).

The sustainable livelihood framework has been developed by various institutions and agencies, including CARE, OXFAM, the Department for International Development (DFID), and the United Nations Development Programme (UNDP). Although these frameworks differ in their orientation, they share a common theoretical ideology given by Chambers and Conway in the 1990s.

1.7 Department for International Development's Sustainable Livelihood Framework

After understanding the several livelihood frameworks, the DFID's Sustainable Livelihood framework was found more appropriate for conceptualising and exploring the livelihood of MSWM employees. The major plus points of the DFID framework are its comprehensiveness, people-centred orientation, and ability to address the complicated and diversified livelihood aspects (Krantz, 2001). It enables a more detailed and holistic analysis, making it well-suited for addressing the specific aspects of the study all alone. Figure 1 represents DFID's SL framework.

Figure 1: The Sustainable Livelihood Framework of the Department for International Development



***Source**: Department for International Development, 1999*

1.8 Components of Sustainable Livelihood Framework developed by the Department for International Development's

The DFID's SL framework serves as a diagnostic tool for better understanding livelihoods and poverty, identifying the factors that enhance or constrain livelihoods (Farrington et al., 2014). As a people-centred approach, it highlights the strategies individuals use to achieve their goals. The components of DFID's SL framework are explained below.

Vulnerability context

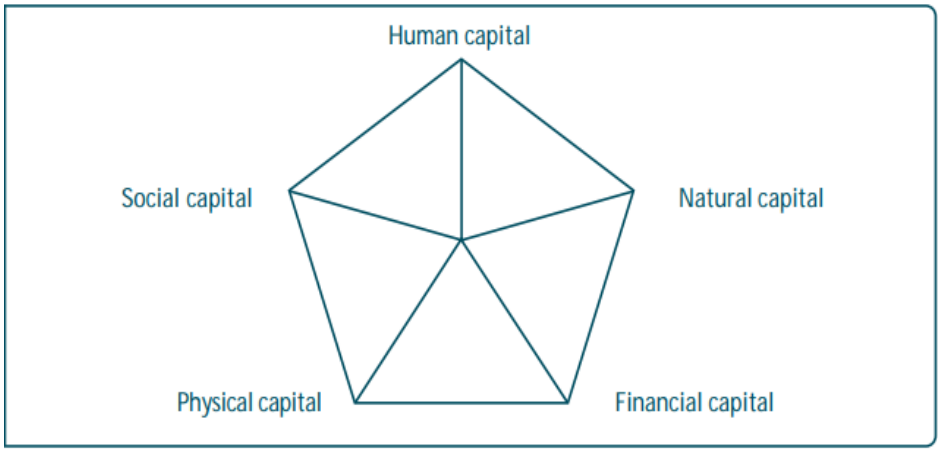
The 'Vulnerability context' denotes the external factors affecting people's livelihoods and access to various assets, strategies, and outcomes. It is in three forms: trends, shocks, and seasonality, over which people have little or no control.

Livelihood Assets

The key aim of the SL approach is to thoroughly understand people's assets and their efforts to transform these into favourable livelihood outcomes. The framework identifies five key assets, often called 'livelihood capitals', which are crucial for attaining positive livelihood outcomes. These include human capital, social capital, natural capital, physical capital, and financial capital. These assets are interrelated and mutually influence one

another in several ways. (DFID, 1999). The following pentagon visually represents the five main types of assets developed in DFID's SL framework.

Figure 2: Asset Pentagon of the Department for International Development's Sustainable Livelihood Framework



***Source**: Department for International Development, 1999*

Transforming Structures and Processes

The 'Transforming Structures and Process' recognises the importance of institutions, policies, and socio-political dynamics in shaping people's livelihoods. It encompasses formal and informal bodies that create and implement rules and policies that affect individuals' access to assets and livelihood opportunities. Additionally, it addresses how legislation, regulations, and cultural norms function and interact with people and communities (DFID, 1999).

Livelihood Strategies

The 'Livelihood Strategies' refers to the choices and activities people undertake to achieve their livelihood goals. These strategies include survival strategies, adaptive strategies, accumulative strategies, coping strategies, and defensive strategies (Morries et al., 2001; Tohidimoghadam et al.,2023). Survival strategies are the activities undertaken to meet the mere basic needs of individuals for survival or the responses to immediate crises. Accumulative strategies are aimed at improving long-term well-being by increasing the resource base (Morries et al., 2001). Adaptive strategies involve adjusting existing practices or exploring new opportunities to reduce vulnerability and achieve a more stable livelihood. Coping strategies are short-term responses to immediate vulnerability (DFID, 1999; Morries et al., 2001). Defensive strategies protect existing

resources from threats and risks (Tohidimoghadam et al.,2023).

Livelihood Outcomes

Livelihood outcomes are noticeable results of diverse livelihood strategies people adopt based on their access to assets, structure, and processes and their resilience to vulnerabilities. These outcomes indicate the level of sustainability of people's lives. These are expressed in the form of financial terms and also consider aspects beyond financial elements like health, human development, and social security indicators and quality of life and well-being (Levine, 2014). They are reflected in improved income, well-being, reduced vulnerability, better food security, and sustainable use of natural resources (DFID, 1999).

Although the vulnerability context appears first in the framework, the analyst has the freedom to begin their analysis at any point based on the study objectives and viewpoints (Levine, 2014).

According to DFID, the following aspects are the indication of the livelihood sustainability of people-

- Ability to withstand shocks and stresses.
- Ability to live without depending on external support in the long run.
- Ability to maintain and conserve the natural resource base for the benefit in the long run (future generation).
- Ability to live without undermining the livelihoods of others or disturbing the livelihood options open to others (DFID, 1999).

1.9 Conceptual Framework of the Study

Based on the DFID livelihood framework and other related studies reviewed, the present study focuses on three aspects of MSWM employees' livelihood that is **livelihood strategy** (primary and alternative), **external support system (ESS),** and **Livelihood sustainability** (based on access to assets). The study primarily explore the link between solid waste management works and the livelihood sustainability of individuals engaging in this work. Therefore, it explores, whether engaging in solid waste management helps individuals achieve the livelihood sustainability of the employees engaging in it. It also examines the role of alternative livelihood strategies and external support systems on the livelihood sustainability of employees. Through this analysis, the study identifies the

factors influencing MSWM employees' livelihoods and suggests measures for the livelihood betterment of employees.

1.9.1 Livelihood sustainability

This study adopts the DFID SL framework's livelihood asset categories, which include human capital, social capital, natural capital, financial capital, and physical capital to measure the overall livelihood sustainability of civic employees engaged in solid waste management. Further, variables are identified under each asset.

Human capital is vital for solid waste management workers. It includes knowledge, skill, physical abilities, and good health (DFID, 1999). Key factors like safety awareness, training, and access to health services, nutrition food, and advanced technologies positively impact on their human capital (Dias, 2011; Nayak et al., 2013; Rajapaksha et al., 2017). Among these employees, HC involves the skill to work safely, maintain good health, the ability to educate their dependents, better safety awareness, and better access health services, and nutritious food.

Social capital refers to the social resources people utilise to pursue livelihood strategies. It consists of networks, social claims, relationships, affiliations, and associations (Soons, 1998). DFID termed 'social capital' as 'resource of last resort' for its vital role in enabling individuals during hardship (DFID, 1999). In the context of employees engaged in the MSWM sector, this study examine their pattern of participation in social groups, their influence on decision makings in the groups, cooperation they receive from unions, friends, and relatives, and societal treatments towards them.

Physical capital describes the access of individuals to infrastructure and equipment essential to perform basic and other productive activities. It includes adequate shelter, access to energy, proper transportation infrastructure, water and sanitation infrastructure, and communication equipment (CARE,2000). With regard to employees engaged in MSWM, physical capital represents the equipment and tools that support them both at their workplace and in their living enviornmnet. Their workplace equipment includes personnel protective equipment (PPE), personnel sanitation facilities (toilet, bathroom, washroom), and restrooms. Analysing household infrastructure is important for understanding the self-sufficiency of their living conditions, including adequate shelter,

sanitation infrastructure, fair access to water infrastructure, and fair access to transportation and household equipment for the comfort of living.

Natural capital means the stock of natural resources like fertile soil, fresh air, clean water, and forestry products that support people's lives and economic activities. It is more significant in rural areas than urban areas due to abundant land and other natural resources. These resources serve as the primary form of capital for those who directly rely on them to fulfil their basic and economic needs. Even though employees in MSWM may not directly depend on natural capital for their livelihood, their health and well-being are in tune with the surrounding environment. An environment free from pollution and disasters promotes better physical and mental health. Hence, the study considered employees' access to land resources and assessed the condition of their surrounding natural environment (Zhao et al.,2020).

Financial capital refers to the stock of financial resources such as cash, cash equivalents, other financial assets, and debt financing that help people undertake various livelihood strategies (Frankenberger & McCaston, 1998; CARE, 2000). It is a particularly influential form of capital in urban areas (CARE, 2000). Employees engaged in MSWM in India face significant financial stress and often rely on indigenous money lenders due to inadequate compensation at the workplace (Veeramani, 2018; Salve et al., 2019). Concerned with MSWM employees, this study examines their earnings, saving patterns, and access to credit facilities.

1.9.2 Livelihood strategy

Livelihood strategy refers to the activity individuals use to secure their means of living (DFID, 1999). MSWM work serves as both a source of income and the primary livelihood strategy for MSWM employees (Rahman et al., 2017). This study examines the impact of MSWM employees' primary livelihood strategy (MSWM work) on their overall livelihood sustainability by focusing on working conditions.

The study also explores the influence of alternative livelihood strategies (strategies other than MSWM work) of MSWM employees on their overall livelihood sustainability. The alternative livelihood strategies are evaluated by exploring the various strategies employees use in addition to their employment in MSWM. These include engaging in other jobs outside of MSWM work to earn additional income as an adaptive strategy,

investing in child education and self-learning as an accumulative strategy, using second-hand materials and walking as expenditure reducing strategy, taking mutual loans and indigenous borrowing as a coping strategy, and cluster staying and getting membership in groups as a defensive strategy (Morris, 2001; Banu & Fazal, 2017; Tohidimoghadam et al.,2023).

1.9.3 External support system

External Support System (ESS) primarily represents macro-level elements. It encompasses the broader policies, institutions, and processes that influence the livelihood sustainability of people through regulatory framework, legislation, funding, or other services. The term 'External Support System' is used instead of 'Policy, Institution, and Process (PIP)' in the DFID SL framework to accurately describe its influences on people's livelihoods. The evaluation of the External Support System involves examining the MSWM employees' perception of their access to various services and support they receive from institutions within the broader macro environment. For this, the study considers variables such as the impact of government schemes and policies on the livelihood improvement of MSWM employees, their influence over government decision-making influencing their lives, and the support they receive from NGOs and other institutions.

2 LITERATURE REVIEW

Every research study relies on the previous studies done in the research area to identify the research gap, to frame the research objectives and develop hypotheses. Accordingly, a review of relevant literature on employees engaged in SWM was conducted and categorized into seven key areas based on the overall findings. The key areas are presented in the following paragraph.

- The working conditions of employees engaged in SWM.
- Socio-economic condition and livelihood aspects of employees engaged in SWM.
- Impact of work on the health and quality of life of the employees engaged in SWM.
- Occupational risks and hazards of the employees engaged in SWM.
- Occupational safety and health behaviour of the employees engaged in SWM.
- Challenges faced (workplace, general, and policy-related) by the MSWM

employees.

- Public perception of the employees engaged in SWM.
- Policy, and regulatory framework applicable to employees engaged in SWM.

(Yellaiah, 2023) explored the **socio-economic and work-related factors** affecting employees in solid waste management. Most respondents were Hindus from Scheduled Castes (SC), largely illiterate, and the second generation in their family in SWM work. Poverty was the primary reason for entering this work, followed by the continuation of ancestral occupation. Key challenges faced by employees include low wages, inadequate health support, lack of infrastructure, ineffective grievance mechanisms, and insufficient PPE. To enhance working conditions, the author recommends that the government should provide medical assistance, ensure an adequate supply of PPE, raise public awareness, and support the education of workers' children.

Khandare & Salve (2023) examined the **health determinants** among Safari Karmacharis engaged in public cleaning and waste collection in Mumbai. It found a strong linkage between Safari Karmacharis' health challenges and their socioeconomic, educational, and caste affiliation status. The prevalent health issues, such as substance abuse and occupational diseases, are the major contributors to higher incidence of illness and disability rates among employees. The authors criticise government initiatives, like the Clean India Campaign, for inadequately addressing caste bias and the insufficient compensation system Safari Karmacharis face at their workplaces. They advocated the need for comprehensive support systems and policy reforms to improve their living and working conditions.

Dwivedi et al. (2023) investigate the **factors influencing sanitation workers' access to social protection benefits,** focusing on both formal and informal workers. Key barriers to accessing social protection benefits among respondents include low awareness, inadequate grievance redressal mechanisms, poorly designed programs, and ineffective institutional support. It is observed that awareness and capacity-building initiatives, and effective collaboration with stakeholders can significantly enhance employees' access to social protection benefits.

Belarmino et al. (2022) evaluated the **health and job perceptions of household waste collectors** in the city of Paraná, Brazil. The waste collectors viewed their work as socially important yet undervalued. They experienced social neglect, a lack of recognition and appreciation, and insufficient medical and psychological support during emergencies. These factors were identified as stressors affecting the respondents' mental health. The authors concluded that the public image of waste collectors could be improved by raising awareness about their contributions to the public

Balasubramanian and Pillai (2021) examined **socio-demographic and work-related differences between permanent and temporary sanitation workers**. It found that permanent workers, mainly from Scheduled Tribes (ST) and Scheduled Castes (SC), work six days a week and often lack education. In contrast, temporary workers, including Other Backward Classes (OBCs) and other castes along with the ST and SCs, work daily and mostly have primary education. The study highlighted that permanent workers enjoy more favourable working conditions. The study suggests that the government should facilitate proper medical facilities, awareness programs, low-interest loans, and social security schemes that are equally applicable to all workers to enhance their quality of life.

M. Ranjith (2021) assessed **job satisfaction among the sanitary workers** in Tirunelveli, Tamil Nadu. The study found that poverty and lack of alternative job experience brought respondents to sanitation work. Job satisfaction of sanitary workers was influenced by socio-demographic factors such as age, gender, education, caste, religion, and family size. The study categorized employees’ problems into economic, social, work-related, and health issues and found their association with demographic factors. The study recommends improving job satisfaction through medical assistance, housing allowances, legal awareness, and educational opportunities for workers' children.

Patil and Raje (2020) examined the **occupational and social hazards of household waste collectors** using structured questionnaires and physical tests. It found that injuries were the major occupational issue, followed by fever and musculoskeletal issues that resulted from extensive walking and frequent bending. Additionally, psychological trauma that employees face due to social discrimination was reported. The authors emphasized the need for regular health check-ups, health awareness programs, and a proper diet to maintain the workers’ health and social awareness initiatives to combat

discrimination against them.

Salve & Jungari (2020) examined the **challenges faced by sanitation workers** engaged in street cleaning, waste collection, drainage cleaning, and waste transportation during COVID-19. The key issues workers faced during the pandemic include denial of leave, stress of disease transmission, inadequate amenities, poor safety gear, and low wages. The authors recommend improving protective equipment, ensuring fair wages, providing job security and health insurance, and addressing wage disparities between permanent and contract workers.

Vikblad and Lekare (2019) examined the **vulnerabilities and livelihood outcomes of sanitation workers** in Babati's waste management sector. Vulnerabilities of sanitation workers in waste management include low salaries, lack of paid leaves and health insurance, job insecurity, poor working conditions, exposure to contaminants, limited safety equipment, weak community support, and inadequate policy attention. Reliance on informal networks emerged as the most effective coping strategy among the worker, which showed a positive impact on their livelihoods. The study suggests that the government should focus on increasing workers' salaries, providing health insurance, and raising public awareness about significance of sanitation workers.

Anusuya & Kavitha (2019) examined the **health issues faced by street sweepers**. Common ailments among the respondents include fungal infections, lacerations, leptospirosis, wrist and hand infections, chronic cough, and eye irritation. Only 9.7% of workers received health and safety training, and 73.6% had partial insurance coverage. The authors recommend government initiatives such as awareness programs, PPE provision, technical equipment, monthly medical check-ups, better salaries, earned leave, and dedicated schemes for street sweepers.

Salve, et al., (2019) conducted a cross-sectional survey comparing **substance use** between SWM workers (street sweepers and waste loaders) and municipal staff (back-office workers and peons). The study found that substance use, including alcohol and tobacco, was significantly higher among SWM workers. Alcohol is often used as a coping strategy against job-related stress, especially among waste loaders. Alcohol consumption was found associated with factors such as education, caste, income, job dissatisfaction,

and mental health. Tobacco use was associated with marital status, education, job satisfaction, and health issues. The authors recommend evidence-based interventions to reduce substance use among SWM workers.

Rayen and Nisee (2017) examined the **working conditions of sanitary employees** in Tirunelveli, Tamil Nadu. They found that most workers are women, illiterate, and from SCs. There are three types of employees: permanent, temporary, and self-help group workers. The study highlighted a disparity among workers belong to different employment types based on the work activities they undertake and their access to tools and equipment in the workplace. The study suggested that medical assistance, legal aid, low-interest loans, better salaries, educational support for children, and improved equipment essential for imporving the wellbeing of employees.

Rahman et al., (2017) studied **how SWM work can enhance the livelihood sustainability of the urban** poor engaged in it. The research, involving 436 informal waste pickers, used stratified random sampling. A structural equation modelling was used to analyze the impact of health hazards and source segregation on worker satisfaction and livelihood sustainability. Findings revealed that both source segregation and health hazards significantly affect satisfaction and sustainability. The study concluded that SWM can reduce poverty and improve livelihoods, with skill acquisition programs further contributing the wellbeing of employees.

Patil & Kamble (2017) studied **health hazards among street sweepers** using Peak Expiratory Flow Rate (PEFR) to assess lung function. They found that sweepers had lower PEFR values than expected, indicating reduced lung function. The study noted an association between work experience and lung capacity of street sweepers. Major health issues observed among street sweepers include musculoskeletal issues, respiratory issues, skin problems, and asthma. The suggested providing long brooms to ease the task, ensuring regular use of masks, conducting health check-ups, and offering insurance services are essential to address these health risks.

Ravindra et al., (2016) examined **occupational risks MSWM workers** and found that 90% of respondents experienced various types of injuries. The study highlighted that poor working conditions and inadequate safety practices are major contributors to these

risks. The authors recommend implementing healthy work practices and conducting employee awareness programs to reduce occupational hazards among SWM workers.

Debassu Eskezia et al., (2016) identified cut/puncture, abrasion, and dislocation as the most common injuries among SWM workers. The study found a significant association of workers' injuries with their education, salary, occupational stress, and the use of personal protective equipment. The authors recommend implementing job rotation, salary hikes, setting productivity limits, and using wheeled containers for garbage collection to reduce occupational injuries.

Das et al., (2013) studied the impact of **health awareness interventions among women sweepers** in Midnapore Municipality. Respondents' knowledge of health hazards, attitudes toward personnel hygiene, and disease prevention practices were compared before and after the interventions. It was found that post-intervention brought a noticeable improvement in knowledge levels, and hygiene practices among respondents.

Pandey (2011) found that due to limited access to natural, financial, and physical capital MSWM workers in Kathmandu had a highly unsustainable livelihood with the majority unable to meet basic needs. Key vulnerabilities that limit their capital include social discrimination, low earnings, and health hazards. The respondents considered social capital as their key survival strategy, and substance usage (alcohol and smoking) as a stress-coping mechanism. The study suggested establishing welfare centres, undertaking livelihood promotion initiatives, and conducting awareness programs to improve their living conditions.

2.1 Summary of the literature review

The review of the literature shows that so far, many studies have been conducted relating to various aspects of employees engaged in SWM in India as well as abroad. Many of these studies predominantly focus on health-related aspects. These studies often address aspects such as the health status of employees, exposure to occupational health risks, the prevalence of different kinds of occupational health hazards including musculoskeletal disorders, accidents, injuries, dermatological issues, and other morbidities, employees' perception of occupational health hazards, health-care-seeking behaviour during health issues, the effectiveness of health risk protection measures, awareness of workers on

potential health issues and health safety behaviour of workers.

Some studies have even explored socio-economic elements, education status, challenges faced by employees, working conditions, and the impact of policies and support systems on improving the working conditions of employees engaged in SWM. However, many of these studies are primarily descriptive in nature and lack advanced analytical tools to provide deeper insights. Further, there is also a noticeable lack of studies related to the border aspect of workers' livelihood, and how employees manage their lives by working in the SWM sector. In states like Karnataka, particularly in Dakshina Kannada (DK) district, there is a noticeable shortage of studies specifically focusing on SWM employees. This indicates a need for more localized research to address the unique issues of SWM employees in these areas.

2.2 Research Gap

The review of the literature shows that studies on employees engaged in SWM in India as well as in some foreign countries primarily focus on health-related aspects. These studies extensively explored occupational health hazards and morbidity profiles, employees' perception of occupational health hazards, health-care-seeking behaviour, the effectiveness of health risk protection measures, awareness of workers on the potential health issues, and the health safety behaviour of workers.

A limited number of studies have explored socio-economic elements, education status, challenges faced by employees, working conditions, and the impact of policies and support systems on improving the working conditions of employees engaged in SWM. However, many of these studies are primarily descriptive in nature and lack advanced analytical tools to provide deeper insights.

More importantly in states like Karnataka, particularly Dakshina Kannada, there is a shortage of studies focusing on socio-economic and livelihood aspects, which limits the understanding of the unique challenges and working conditions of employees engaged in solid waste management work in this region. Additionally, there is a noticeable gap in research addressing the livelihood pattern, broader livelihood aspects, and the impact of work on the livelihood sustainability of these employees. All these observations from the literature review clearly indicate that this is an under- researched area and there is a

research gap in this area. Hence, an attempt is made to fulfil this gap by undertaking a comprehensive analysis of socio-economic conditions, working conditions, challenges, livelihood strategy, support system, and pattern of impact work has on the livelihood sustainability of employees engaged in SWM. Therefore, the study is entitled as 'An Empirical Study of Livelihood Pattern of Civic Employees Engaged in Solid Waste Management in Dakshina Kannada District'.

3 STATEMENT OF THE RESEARCH PROBLEM

Economic growth and population expansion have led to increased waste generation in cities, necessitating more personnel for its management. This has created numerous employment opportunities in the form of waste collection, street sweeping, transportation, informal picking of waste, recycling, and scavengers, and offering a potential source of livelihood for many poor people. However, the hazardous nature of waste, unfavorable working conditions, and social stigma attached to these jobs pose serious health risks and social challenges to these employees, undermining their well-being despite their valuable service to society and environmental safety.

Employees working within the formal structure of urban local bodies in the waste management sector are often perceived as having secure jobs due to their official affiliation. However, the reality is different, many of these workers earn low wages, endure poor working conditions, and face minimal job security (Thorat, 2021; Sathya & Gayathri, 2020; Salve & Jungari 2020**)**. Although the government has introduced several schemes and policies aimed at enhancing their welfare, these initiatives are often ineffective on the ground level, and a lack of awareness among workers further limits their access to these benefits**.** In some cases, poorly executed schemes can even exacerbate their already existing struggles (Darokar, 2018). Additionally, these workers frequently face social discrimination due to their work identity, both on the job and in social settings. Women and lower-caste workers are particularly vulnerable, facing heightened challenges related to their gender and caste, which expose them to exploitation and threats in their workplace and society (Acharya, 2013). These kinds of discrimination severely restrict their ability to negotiate better working conditions or exercise their legal rights, keeping them in a perpetually vulnerable state.

Therefore, it is necessary to understand the actual situation of SWM employees and their living and working conditions. This understanding helps in developing initiatives that reduce their work-related worries and enhance livelihood sustainability. If no effort is made to understand their real situation, they and their future generations are more likely to remain a vulnerable community.

4 STATEMENT OF THE RESEARCH QUESTIONS

Developing clear and focused research questions is a crucial step in the research process. It shapes the study, determines the methodology, and guides all phases of inquiry, analysis, and reporting. The following research questions have been formulated for the proposed study-

1. What are the socio-demographic characteristics of civic employees engaged in solid waste management?
2. What kind of working conditions do civic employees engaged in solid waste management have?
3. What are the challenges of civic employees engaged in solid waste management?
4. What is the extent of livelihood sustainability among civic employees engaged in solid waste management?
5. Can being an employee of solid waste management lead towards livelihood sustainability?

5 OBJECTIVES OF THE STUDY

The study aims to address the following objectives:

1. To examine the socio-demographic characteristics of civic employees engaged in solid waste management.
2. To evaluate the working conditions of civic employees engaged in solid waste management.
3. To document the challenges of civic employees engaged in solid waste management.
4. To measure the extent of livelihood sustainability among civic employees engaged in solid waste management.
5. To assess whether working as civic employees engaged in solid waste management

6 HYPOTHESES OF THE RESEARCH

6.1 Factors determine the employee's entry into the solid waste management work.

Municipal solid waste management work is a livelihood strategy used by a section of people especially the urban poor (Rahman, et al., 2017; Shankar & Sahni, 2018; Arjun, 2023). Low education and poverty were found to be the primary factors that led people to enter into this work (Rayen & Nisee 2016; Shankar & Sahni, 2018; Nandimath, et al., 2019; PRIA, 2019; Arjun, 2023; Yellaiah, 2023). To investigate whether Low education and poverty are the primary reasons that led municipal solid waste management employees to choose this work, the following hypothesis is developed.

H0: Low education and poverty are not the primary reasons as to why employees enter solid waste management work.

H1: Low education and poverty are the primary reasons as to why employees enter solid waste management work.

6.2 The working conditions of civic employees engaged in solid waste management.

Working conditions are termed as the environment in which employees perform their work, encompassing all physical and psychological factors that influence their well-being and performance (Lee, et al., 2014; Manyisa & Aswegen, 2017). For civic employees engaged in SWM, working conditions act as a critical determinant of their health, safety, job satisfaction, and overall quality of life (Jayakrishnan, et al., 2013; Lissah et al., 2020). Key factors influencing their working condition are salary system, leaves facilities, health insurance coverage, job security, training, interpersonal relationships at the workplace, provision of PPE, provision of work equipment, welfare facilities, the conduct of awareness programs, medical facilities, grievance redressed mechanism, growth opportunities, and sanitation facilities (Mishra, et al., 2012; Jayakrishnan, et al., 2013; Ravindra, Kaur, & Mor, 2016; Rayen & Nisee 2016; DalbergAdvisors, 2017; Thakur, et al., 2018; Salve & Jungari 2020; Sathya & Gayathri, 2020; Lakshmi, et al., 2021).

Additionally, studies highlighted disparities in the working conditions among MSWM employees based on their employment types like permanent, contract, and other types (Rayen & Nisee 2016; Veeramani, 2018; Sathya & Gayathri, 2020; Balasubramanian & Pillai, 2021). To investigate whether the working conditions of the employees engaged in the MSWM vary across their employment types, the following hypothesis is developed.

H0: There is no difference in the working conditions of civic employees across different employment types.

H1: There is a difference in the working conditions of civic employees across different employment types.

6.3. The challenges faced by the civic employees engaged in solid waste management.

MSWM employees face a variety of challenges both at the workplace and outside their work. In India, major workplace challenges faced by MSWM employees include low wages, lack of supply of PPEs, unavailability of sanitation facilities, lack of job security, and health issues (Acharya, 2013; Rangmani, et al., 2015; DalbergAdvisors, 2017; Salve & Jungari, 2020). Additionally, these employees often experience social issues like discrimination, untouchability, public misbehaviour, and poor nutrition (PRIA, 2019; Lenka, 2019; Dasgupta, S, et al., 2023).

Studies have identified employment type as a key factor contributing to differences in the challenges faced by these employees (Veeramani, 2018; Salve & Jungari, 2020; TNUSSP, 2020). To understand whether challenges faced by civic employees engaged in SWM vary across their employment types. The following hypothesis is framed,

H0: There is no difference in the challenges faced by civic employees engaged in solid waste management across their employment types.

H1: There is a difference in the challenges faced by civic employees engaged in solid waste management across their employment types.

6.4 Livelihood sustainability of civic employees engaged in solid waste management.

There is no doubt that work has a significant impact on the livelihood sustainability of individuals in various ways. Safe and healthy working conditions prevent employees from occupational hazards. Fair compensation helps the workers to meet their financial commitments, save, and invest in personnel and family well-being. Opportunities for training enhance employees' skills and safety behaviour (Rajapaksha, et al., 2017; Shrivastava, 2020**).** The security of jobs and the provision of social security schemes provided them with a sense of economic security (Thorat, 2021). Conducting awareness programs on occupation health and safety, providing effective medical services, provision of personnel protective equipment, and maintaining standard working hours contribute to employees' good health and stability **(**Spurgeon et al., 1997; Chellamma, et al., 2015;

Thakur, et al., 2018; Hassan, et al., 2021). The health awareness programs equip employees with essential occupational safety knowledge (R, Das, et al., 2013; Nayak., S, et al., 2013), and awareness programs on government initiatives help them to access government benefits efficiently (Dwivedi, et al., 2023)**.** Wage or earnings from employment influence individuals' spending, and saving patterns. Work recognition provides individuals with a sense of value and respect in the workplace and society in turn enhances their mental health (Belarmino, et al., 2022). Proper interpersonal relationships at the workplace help individuals improve psychological health and maintain emotional balance (Sathya & Gayathri, 2020). Hence present study investigates the possible relationship between work conditions and livelihood sustainability by using the following hypothesis-

H0: There is no association between the working conditions and the livelihood sustainability of civic employees engaged in solid waste management.

H1: There is an association between the working conditions and the livelihood sustainability of civic employees engaged in solid waste management.

6.5 Influence of Alternative livelihood strategies on the Livelihood sustainability of civic employees engaged in solid waste management.

MSWM employees found using a variety of Alternative livelihood Strategies including engaging in a job outside MSWM work, investing in child education and self-learning, using second-hand materials, walking to save money, taking mutual loans and indigenous borrowing, and cluster staying and getting membership in groups. Hence present study investigates the possible association between Alternative livelihood strategies of MSWM employees and their livelihood sustainability by using the following hypothesis.

H0: Alternative livelihood strategies and livelihood sustainability of civic employees engaged in solid waste management are not associated.

H1: Alternative livelihood strategies and livelihood sustainability of civic employees engaged in solid waste management are associated.

6.6 Influence of External Support system on the Livelihood sustainability of civic employees engaged in solid waste management.

To evaluate the impact of prevailing external support system on livelihood sustainability of MSWM employees study employed following hypothesis-

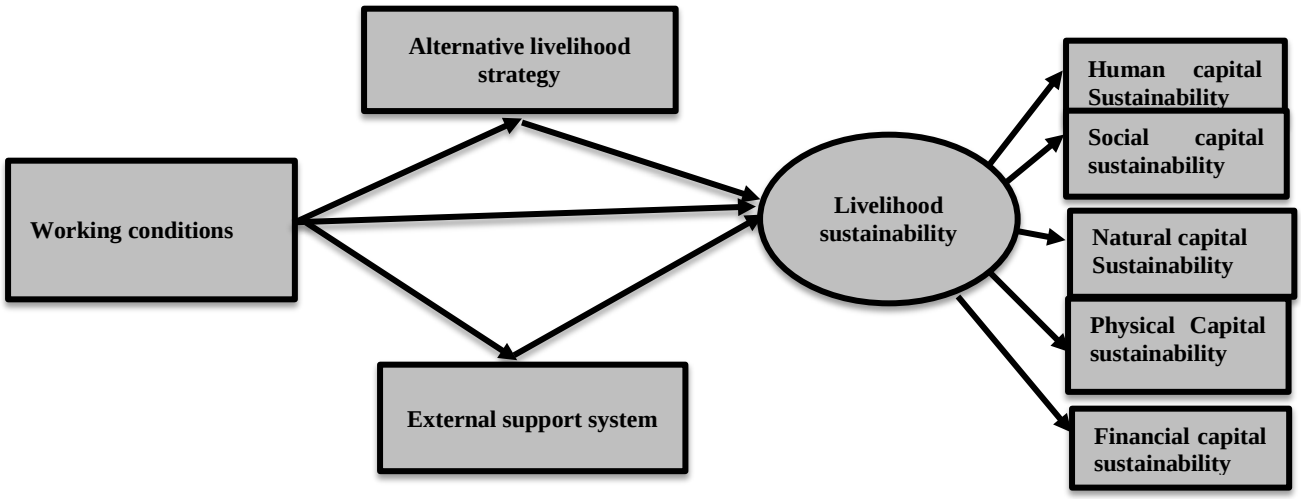
H0: There is no association between alternative livelihood strategies and livelihood sustainability of civic employees engaged in solid waste management.

H1: There is no association between alternative livelihood strategies and livelihood sustainability of civic employees engaged in solid waste management.

7 CONCEPTUAL MODEL OF THE STUDY

Based on the theoretical grounds and key variables considered in the study, a conceptual model is proposed and presented in Figure 3.

Figure 3: Conceptual model of the present research study



Source: *Developed by the researcher*

8 RESEARCH METHODOLOGY

In order to achieve the objectives of the study, a comprehensive methodological approach has been employed. The research adopted an empirical approach and employed descriptive, exploratory and analytical methods. The exploratory method is used to gain a deeper understanding of the research problem, and descriptive research provides a

detailed description of the situation concerning the sample population and research area. The analytical method examines the relationship between the variables considered in the study.

8.1 Sources of Data: The study is based on both primary and secondary data sources.

Primary data:

Primary data is collected from employees engaged in SWM using a questionnaire method. A total of 400 questionnaires were administered. 352 responses were received. After screening, 335 responses were considered for the study. Additionally, data is gathered through interviews with municipal officials and officials in charge of contracting companies entrusted with the official contract for solid waste management in the ULBs of Dakshina Kannada district.

Secondary data:

District Environmental Plan for Dakshina-Kannada-district Karnataka state, 2022 and individual websites of ULBs in DK were referred to gather the existing situation of SWM in Dakshina Kannada district.

The secondary data from the book (Social Innovations in Urban Sanitation in India and Solid Waste Management); articles published in the journals; reports of government agencies (SWM Rule, 2016, Annual Report on Solid Waste Management 2021-22, National Safai Karmachari Finance and Development Corporation annual Report-2022-23 ,Karnataka Human Development Report, 2022, Economic survey report), reports published by world bank (What a waste 2.0 and Poverty and Health) and United Nations Environmental Programme (Solid Waste Management-Volume 1), census report including marine census reports, article in periodicals and newspaper like the Times of India (online version). Online databases like Google Scholar, Research Gate, Scopus, Web of Science and Shodhganga were also utilised for secondary data search.

8.2 Questionnaire Design

The questionnaire was constructed after an extensive review of relevant literature and divided into six sections. The first section collected data on the socio-demographic details of the respondents. The second section collected data on the living conditions of the respondents. The third section focused on respondents' work-related general information.

This section also gathered data on the reasons as to why employees entered solid waste management work. The fourth section collected data on the working conditions of the respondents. The measurement scale was designed to assess the working conditions of civic solid waste management employees based on their perceptions of their work conditions. The concept of decent work, as outlined by the International Labour Organisation (ILO) and other agencies, was considered while identifying and incorporating the elements of working conditions (GHAI, 2003). Additionally, the data from previous studies was also considered (Selvamani and Rajan, 2015; Rayen and Nisee, 2016; Ghosh, 2017; Rajapaksha et al.,2017; Nisee, 2018; Veeramani, 2018; Lakshmi et al., 2021; Balasubramanian and Pillai, 2021; Yellaiah, 2023. The Fifth section focused on the challenges faced by the respondents. The challenges civic solid waste management employees face are based on their perceptions of the difficulties they experience at work and in society. The common challenges faced by the employees were identified through previous studies (Rangamani et al., 2015; Ghosh 2017; Salve et al., 2017; Sophia & Pavithra, 2017; Dalberg Advisors, 2017; Darokar, 2018; PRIA, 2019; Acharya, 2019; Karwade, 2019; Ramya, 2019; Salve & Jungari, 2020; Paliath, 2020; Gomathi & Kamala, 2020; Thorat, 2021; Priyanka & Amora, 2022; Meena et al., 2022; Dasgupta et al., 2023; Yellaiah, 2023; Thodukayil et al., 2024). The sixth section focused on the measurement of livelihood sustainability of the respondents. The measurement of livelihood sustainability consists of five sub-variables as: human capital sustainability, social capital sustainability, natural capital sustainability, physical capital sustainability, and financial capital sustainability. In case of validating the variable under each component, the previous studies were considered (Mahapatra, 2007; Adhikari 2007; Pandey, 2011; Bhuiyan et al., 2012; Piya et al., 2016; Marulanda et al., 2020; Paul et al., 2020; Rahman et al., 2017; Zhang, 2016; Vikblad & Lekare, 2019; Uddin et al., 2020). This section also gathered data on respondents' alternative livelihood strategy choices and their access to external support systems to examine their impact on the livelihood sustainability of respondents. To identify common alternative livelihood strategies among solid waste management employees, previous studies were observed (Yuniarti et al., 2017; Amphune et al., 2018; Su et al., 2019; Afrin & Islam, 2021).

8.3 Pilot Study and Reliability Test

Following the development of the questionnaire, a pilot survey was conducted with 50

respondents to check the appropriateness of the questions and internal consistency of the items used in the questionnaire. Hence, a reliability test was performed. The reliability test measures the consistency of test scores derived from the collected data and assesses the extent to which the results are free from errors (Livingston, 2018). Necessary revisions were made to the questionnaire based on the reliability test results, and the reliability of the main questionnaire was checked once more. The Cronbach's alpha value derived after conducting the reliability test on the final scale items is presented in Table 1.

Table 1: Cronbach's Alpha reliability coefficient

Variables assessed	Respondents	Number of items
Working conditions of the respondents	0.810	23
Challenges faced by the respondents	0.857	23
Alternative livelihood strategies of the respondents	0.760	9
Respondents' access to external support system	0.776	5
Human capital sustainability of the respondents	0.811	6
Social capital sustainability of the respondents	0.793	7
Natural capital sustainability of the respondents	0.751	3
Physical capital sustainability of the respondents	0.751	6
Financial capital sustainability of the respondents	0.742	3

***Source**: Primary Survey data*

Following the pilot survey, only items with a Cronbach's Alpha value of 0.70 or higher were retained for the main study. The test results in the above table indicate that values for all variables considered in the study exceed 0.70, thus the data collected for the research is considered statistically suitable for applying various statistical analyses to fulfil the research objectives.

8.4 Construct validity test for principal component analysis

Kaiser-Meyer-Olkin (KMO) Test and Bartlett's Test of Sphericity were used to assess the suitability of the data for performing Principal Component Analysis, the results of which are presented in the following table-

Table 2: Construct validity test for principal component analysis

Sl. No.	Variables	Kaiser-Meyer-Olkin measure of sampling adequacy	Bartlett's Test of Sphericity approxi. Chi-square	d.f	Significance
1	Reasons as to why respondents entered solid waste management work	0.700	1182.269	55	0.000**
2	Challenged faced by the employees	0.857	4959.234	253	0.000**

** Significant at 5 % level of significance

Interpretation: From the above table it was observed that the KMO values for all selected variables are at least 0.70, and the p-value for Bartlett's test of Sphericity is less than 0.05. This indicates that there is a significant level of variance among the variables considered in the analysis.

8.5 Period of the Study

The research began in the year 2019. However, during March 2020 Covid lockdown was announced. Even in 2021 the impact of Covid was there. Hence, the survey was conducted from March 2023 to December 2023. Data analysis and interpretation were carried out from January 2024 to August 2024. The thesis was finalised in April 2025.

8.6 Research Tools and Software used for data analysis

Various statistical techniques were employed in the study for data analysis

1. **Reliability tests**: Reliability tests were used to measure the internal consistency of the variables, such as reasons as to why respondents enter solid waste management work, working conditions of the respondents, challenges faced by the respondents, livelihood strategy used by the respondents, respondents' access to external support system, and components considered under livelihood sustainability.
2. **Correlation analysis**: It was used to examine the association between variables such as working conditions and livelihood sustainability of the respondents. In order to see the association of livelihood sustainability with alternative livelihood strategies, and external support system access of respondents.

3. **Chi-square test and Fisher's exact test:** These two tests were used to examine the relationship between the working conditions of the respondents and their employment types, as well as the relationship between the challenges of the respondents and their employment types.
4. **Principal Component Analysis (PCA):** It was used to explore the reasons as to why respondents entered solid waste management work and the challenges faced by the respondents.
5. **Kaiser-Meyer-Olkin Test and Bartlett's Test of Sphericity:** These two tests were used to assess the suitability of the data for performing Principal Component Analysis (PCA) in case of variables such as reasons as to why respondents entered solid waste work and challenges faced by the respondents.
6. **Structural Equation Modelling (SEM)**: It was used to analyse the impact of solid waste management work on the livelihoods of civic employees engaged in this SWM work. Additionally, to understand the complex relationships between the variables associated with respondents' lives.
7. **Scaling techniques:** The study used various scaling techniques, such as nominal, ordinal and interval scales, to obtain a wide range of data for detailed analysis and interpretation. Each scale was chosen based on the nature of the data, ensuring its relevance for the statistical tests required to justify the study objectives.

8.7 Description of the study area

Dakshina Kannada, a coastal district with robust economic activity, is among the highly urbanised districts of Karnataka state of India. The district's strong economic performance, high level literacy levels, and strong Human Development Index (HDI) have resulted in significant population growth (Karnataka Human Development Report, 2022; Economic Survey of Karnataka, 2023-24). This population growth has led to an increase in waste generation, highlighting the critical role of employees engaged in waste management. Unfortunately, employees in this sector often face miserable working and living conditions. However, the specific conditions of workers in this district are not well-documented. The present study evaluates the current state of working and living conditions of employees engaged in MSWM. It assesses the implications of their work on their lives within the jurisdiction limits of urban local bodies (ULBs) in the district. All fourteen urban local bodies in the district namely, Mangaluru City Corporation, Puttur

City Council, Ullal City Council, Bantwala town Council, Moodabidre town council, Someshwara town council, Bajpe Town Panchayat, Belthangadi Town Panchayat, Kadaba Town Panchayat, Kinnigoli Town Panchayat, Kotekar Town Panchayat, Mulki Town Panchayat, Sullia Town Panchayat, and Vitla Town Panchayat, are considered in the study.

8.8 Sample size and sampling technique

The primary data is collected from the employees engaged in SWM in the urban local bodies of Dakshina Kannada district. These employees, often called as civic employees, are employed under three types: permanent, direct payment, and contract. Additionally, data was collected from the officials involved in SWM within these urban local bodies, including environmental engineers, health inspectors, and supervisors, to gain insight into the employment situations of SWM workers. Data was also collected from managers and supervisors of contract companies responsible for solid waste management in the study area.

The total population of the study comprises 905 employees, is 145 permanent employees, 282 direct payment employees, and 478 contract employees. The present study is primarily survey-based research with a relatively small and known population. Therefore, the **Yamane formula** is viewed as an ideal choice for sample size determination (Uakarn et al., 2021).

The Yamane formula for sample size calculation =

$n = N /1 + N(e)^2$

In the above formula, **n** stands for the sample size, **N** stands for the total population size, and **e** stands for the level of precision (Israel, 1992).

$n = N /1 + N(e)^2$

$905/1+905(5\%)^2 = 277.4 = 277$

Using the Yamane formula, the calculated sample size is 277. However, to enhance the data reliability a sample size of **335** was considered for the study.

The considered sample size of 335, was picked using a ‘***Proportionate Stratified Random Sampling method’***. All 14 ULBs in the district, are considered as a stratum and the sample was drawn from these ULBs based on their population proportion to ensure fair representation. Detailed information on the study population and sample size is given

in Table 3.

Table 3: Population and sample size of the study

Sl.No.	Name of the urban local body	Population (Civic employees)				Sample size			
		Permanent	Direct payment (DP)	Contract	Total	Permanent	Direct payment (DP)	Contract	Total
1	Mangaluru City Corporation	137	-	478	**615**	51	-	177	**228**
2	Puttur City Council	4	46	-	**50**	1	17	-	**18**
3	Ullal City Council	4	36	-	**40**	1	13		**14**
4	Bantwala town Council	-	34	-	**34**	-	13	-	**13**
5	Moodabidre town council	-	46	-	**46**	-	17	-	**17**
6	Someshwara town council	-	15	-	**15**	-	6	-	**6**
7	Bajpe Town Panchayat	-	7	-	**7**	-	3	-	**3**
8	Belthangadi Town Panchayat	-	10	-	**10**	-	4	-	**4**
9	Kadaba Town Panchayat	-	10	-	**10**	-	4	-	**4**
10	Kinnigoli Town Panchayat	-	16	-	**16**	-	6	-	**6**
11	Kotekar Town Panchayat	-	12	-	**12**	-	4	-	**4**
12	Mulki Town Panchayat	-	19	-	**19**	-	7	-	**7**
13	Sullia Town Panchayat	-	14	-	**14**	-	5	-	**5**
14	Vitla Town Panchayat	-	17	-	**17**	-	6	-	**6**
	Total	**145**	**282**	**478**	**905**	**53**	**105**	**177**	**335**

***Source**: Derived using proportionate stratified random sampling techniques*

9 SCOPE OF THE STUDY

The present study focuses on grassroots employees engaged in solid waste management activities in urban local bodies in Dakshina Kannada District. In the study, the term 'civic employees engaged in solid waste management' refers to the employees who are recruited directly by urban local bodies or hired through agencies to deliver services to citizens on behalf of urban local bodies. They are positioned at the lower end of the employment hierarchy, with their work coming under the supervisory purview of urban local bodies. Their employment arrangements differ as permanent, direct payment, and contract employment. However, all of them carry out the same civic functions on behalf of the urban local bodies, ensuring the efficient management and disposal of waste, which is critical for public health and cleanliness. In the study, the terms 'civic solid waste employees' and 'municipal solid waste employees' are used interchangeably depending on the context. It aims to examine the factors influencing the job choice decisions of employees, their socio-demographic characteristics, working and living conditions, challenges encountered, and the extent of institutional and external support

they receive. The study also evaluates the livelihood sustainability of these employees. The study is micro in nature, as the study focuses on one specific district only. The conclusions are derived from the empirical data gathered throughout the course of the study.

10 SIGNIFICANCE OF THE STUDY

SWM work poses a significant challenge for ULBs, and its effectiveness largely depends on the efficiency and performance of employees. Therefore, effectively managing this workforce is crucial. This workforce has long faced numerous challenges, including negative public perception, exposure to health risks, poor working conditions, job insecurity, and inadequate basic facilities. A comprehensive study was undertaken to address these issues and improve their well-being, focusing on their actual conditions and the factors influencing their livelihood is necessary. The present study on civic employees engaged in SWM in Dakshina Kannada district is significant for the following reasons,

- The study intends to explore the socioeconomic status, working conditions, challenges, broader livelihood issues, and factors impacting the livelihood sustainability of civic employees engaged in SWM. Additionally, this research seeks to offer deeper insights into the livelihood conditions of these workers.
- The study also seeks to explore the general and specific challenges faced by MSWM workers by analysing both their work and social lives.
- The study examines the relationship between SWM work and employees' livelihood sustainability, assessing whether SWM work significantly helps them to achieve livelihood sustainability. It also provides suggestions based on the study findings for enhancing their conditions.

11 LIMITATIONS OF THE STUDY

- The study is confined to employees working in SWM within urban local bodies, excluding informal employees engaging in SWM and employees working in rural local bodies (Village Panchayats).
- The research is limited to the Dakshina Kannada district of Karnataka state in India and does not extend beyond this geographical area.

- Solid Waste Management (SWM) primarily involves outdoor tasks and requires employees to constantly move from one location to another for work purposes. This made it difficult to approach the MSWM employees and collect data, which delayed the data collection process.
- Some respondents were reluctant to provide actual information due to the fear that their responses might adversely affect their jobs, which may impact data accuracy and reliability.

12 CHAPTER SCHEME OF THE STUDY

The thesis is structured into five chapters as outlined below:

Chapter I: Introduction

This chapter includes an initial introduction to the study, research background, conceptual background, statement of the problem, research questions, objectives, research methodology, significance of the study, scope and limitations of the study, and chapter scheme of the thesis.

Chapter II: Literature Review

A detailed review of previous research works conducted in the study area, including both Indian and foreign literature, is depicted in this section. A detailed summary of the literature review and research gap are also provided.

Chapter III: Profile of the Study Area

This chapter discusses the study area. The chapter considers data on geographical, demographical, economic, and infrastructural features of the study area. Additionally, an overview of the Municipal solid waste management system in the district is presented.

Chapter IV: Data Analysis and Interpretation

The research questions posed in the study are answered in this section. It has been organised into six sections: the socio-demographic profile, living conditions, general information about the work, working conditions, challenges, and livelihood sustainability of the respondents. The chapter also comprises the other factors impacting the livelihood sustainability of respondents, including alternative livelihood strategies of respondents and their access to external support systems. This chapter also consists of an accepted conceptual model based on the ideology of the Sustainable Livelihood Framework used to uncover the factors that influence the livelihood sustainability of employees engaged in

solid waste management work.

Chapter V: Findings, Suggestions, and Conclusion

This chapter details the findings of the study. Furthermore, suggestions based on those findings, the conclusion, and the directions for further research are presented.

13 MAJOR FINDINGS OF THE STUDY

The overall findings of the study are grouped into seven parts mainly aligned with the study objectives.

13.1 Findings on socio-demographic characteristics of respondents

- Age-based investigation shows that a majority (41.2 per cent) of the civic employees engaged in SWM are aged between 25 and 35 years followed by employees aged between 36 and 45 years.
- A majority of civic employees engaged in SWM are male employees (54.9 per cent).
- Education status-based analysis indicates that a majority of the civic employees engaged in solid waste management in DK had studied 6^{th} to 10^{th} standard (47.8 per cent), followed by respondents without formal education (25.9 per cent). The education attainment rate of these employees is found to be below that of the national average in India (https://community.data.gov.in/literacy-rate/). This is indeed an indication of the linkage between the education levels of employees and their involvement in SWM work.
- A majority of respondents belong to the Hindu community (95.5 per cent). There is a presence of Muslim solid waste workers (4.5 per cent), though they constitute a small portion.
- A majority of MSWM workers belong to the scheduled caste category (58.5 per cent), followed by the scheduled tribe category (23.3 percent), and the remaining 18.2 percent from the OBC category.
- A majority of respondents are married (76.4 per cent) and have 2 children (45.4 per cent).
- The family structure of civic employees engaged in SWM reveals that more than half (62.1 per cent) of them are part of the nuclear family, while the remaining are predominantly (30.15 per cent) part of the joint.

- A majority of the respondents belong to a family of 5 to 7 members (45.7 per cent), followed by employees belonging to a family of 2 to 4 members (40.0 per cent).
- A majority of MSWM workers possess ration cards (76.4 per cent) and hold BPL ration cards (70.7 per cent), followed by APL ration cards (28.1per cent) and a small portion even holds Antyodaya ration cards (1.2 per cent). This indicates a majority of municipal solid waste management workers fall under below poverty line category (71.9 per cent).
- Family annual income-based analysis reveals that civic employees engaged in SWM predominantly belong to a family having annual income ranging from rupees 300001 to 450000 (40.6 per cent), followed by a family income ranging from rupees 150001 to 300000 (40.0 per cent).
- More than half of the respondents migrated to Dakshina Kannada district from their native districts and states for job purposes (55.2 per cent).

13.2 Findings on Living conditions

- Land ownership-related analysis shows that a majority of respondents, i.e. 224 employees (66.9 per cent) did own land. Among them, a majority i.e. 93 employees (41.5 per cent) did own less than 10 cents. It was also observed that a majority of the respondents i.e. 120 employees (53.6 per cent) got these land sites from government schemes.
- A significant portion of the municipal solid waste management workers employees reside in urban areas (92.5 per cent).
- A majority of the respondents stay in rented houses (54.6 per cent).
- More than half of the MSWM employees live in pucca-type houses (92.5%) and have 2-3 rooms in their homes (51.6 per cent).
- The majority of the MSWM employees depend on municipal water supply both for consumption (87.5 percent) and other household purposes (80.9 percent).
- A large portion of the MSWM employees have proper personnel sanitation facilities at their homes (77.0 per cent).
- A majority of the respondents (81.5 percent) are satisfied with the drainage infrastructure available at their homes.
- LPG is the primary cooking fuel used by the respondents in their homes (82.4 per cent), followed by firewood (49 per cent).

- A significant majority of the respondents (96.4 percent) have access to electricity in their homes. However, a small portion (3.6 percent) lacks electricity and primarily relies on oil lamps (66.7 percent).
- A majority of the respondents have access to assets such as mobile phones (94.9 per cent), fans (86.6 per cent), mixer grinders (79.4 per cent), chairs (76.1 per cent), and television (56.1 per cent). However, their access to assets like computers, four-wheelers, three-wheelers, washing machines, and tables remains low.
- Food constitutes the largest portion of the monthly spending among respondents, followed by housing maintenance expenses followed by loan repayment. Healthcare and education rank lower, indicating that these are less prioritized expenditure items for the respondents.
- All the respondents have a habit of saving monthly (100 per cent) with most saving an amount ranging from 2001 to 5000 per month (62.4 per cent). Salary-linked bank accounts serve as the primary saving avenues for many of them (84.8 percent).
- A majority of the respondents (60.9 per cent) have some form of debt with the majority carrying debt amounts ranging from 50001 to 100000 (31.4 per cent). Public sector banks are the leading source of loans for these individuals (39.7 per cent), with house construction (37.7 per cent) being the primary reason for taking on debt.
- A majority of the MSWM employees (83.6 per cent) hold membership in various groups, with many of them being the members of workers' association (87.9 per cent).

13.3 Findings relating to the work profile of respondents

- A majority of the respondents, i.e. 177 respondents (52.8 per cent) were employed on a contract basis, followed by 104 respondents (31.0 per cent) working under direct payment employment basis. Only 54 respondents (16.1 per cent) were employed on a permanent basis. This indicates that the MSWM sector in Dakshina Kannada predominantly relied on non-permanent employees, reflecting a workforce structure with limited job stability.
- A significant number of respondents, i.e. 159 individuals (47.5 per cent), were engaged in street sweeping, followed by 144 individuals (43.0 per cent) involved in door-to-door waste collection. This analysis reveals that street sweeping was the dominant occupation among respondents. This trend can be attributed to the labour-

intensive nature of street sweeping, which still relies on traditional tools like brooms and metal plates.

- A majority of the respondents, i.e. 154 employees 46.0 per cent), had work experience ranging from 6 to 10 years in SWM work. The relatively short period of employees' work experience can be attributed to the recent increase in workforce demand by ULBs. It also reflects the sector's tendency to attract individuals seeking short-term employment to meet their immediate survival needs.
- Most respondents, i.e. 233 employees (77.6 per cent), reported earning less than rupees 20,000 per month. This is attributed to the fact that the majority of respondents were employed under a contract or on a direct payment employment basis.
- More than half of the respondents, i.e. 250 individuals (74.6 per cent), were working for 6 to 8 hours per day, and the rest, 85 respondents (25.4 per cent), were undertaking work for 9 to 11 hours per day. Despite the extra work done by employees, they were not receiving any overtime allowance. This is a matter of concern and a violation of the welfare act of the Indian legal system.
- Three factors were derived using principal component analysis while examining the reasons as to why respondents entered solid waste management work. These factors were named as socio-economic factors, job convenience consideration factors, and source of regular income-related factors. It is understood that the primary reason respondents entered solid waste management work was socio-economic factors. It includes low education (factor loading 0.782), the pressure of debt (factor loading 0.762), parental background (factor loading 0.750), poverty at home (factor loading 0.713), and financial independence (factor loading 0.705).

13.4 Findings on employees' working conditions

- A majority of the respondents, i.e. 215 employees (64.2 per cent), reported experiencing poor working conditions. This indicated that the overall working conditions for the workers were inadequate. The primary factors contributing to these poor working conditions include lack of training (mean value of 2.0), limited career growth opportunities at the workplace (mean value of 2.2), inadequate workplace issue resolution procedure (mean value of 2.4), low job recognition (mean value of 2.4), inadequate leave facilities (mean value of 2.4), inadequate conduct of awareness programs (mean value of 2.4), lack of welfare facilities (mean value of 2.5), low job

security (mean value of 2.8), unfair working hours (mean value of 3.0), and unfair salary system (mean value of 3.0).

- An examination of variations in working conditions across different employment types of employees, namely permanent, direct payment, and contract employment modes, using the chi-square test, revealed a statistically significant impact of employment type on employees' experiences with working conditions. The Key factors contributing to these variations include job security, working time, compensation system, welfare facilities and issue resolution procedures at the workplace.
- An assessment of respondents' awareness regarding schemes revealed that a majority of the respondents, i.e. 200 employees (59.7 per cent), had a moderate level of awareness regarding the welfare schemes provided by the urban local bodies (ULBs), state agency and National Safai Karmachari Financial and Development Corporation (NSKFDC). The study observed that awareness-raising efforts by state agencies and urban local bodies are being carried out to some extent on a timely basis. However, awareness creation regarding the schemes of NSKFDC has been largely neglected. In some ULBs, even the officials responsible for disseminating information among employees lacked proper knowledge about these schemes. These factors have a serious implication on employees' awareness regarding the schemes.
- Regarding respondents' utilisation of schemes provided by the urban local bodies (ULBs) and National Safai Karmachari Financial and Development Corporation (NSKFDC), it was found that a majority of the respondents, i.e. 323 employees (96.4 per cent) reported low utilisation of these schemes. Study observed that overall awareness of the schemes among employees remains at moderate level, with most lacking information about those introduced by the National Safai Karmacharies Financial and Development Corporation. This lack of awareness could be a key reason behind the underutilisation of the schemes. Moreover, it raises concerns about the suitability and effectiveness of these welfare measures for workers.

13.5 Findings on work implications on employees' health

- From the analysis of the occurrence of health issues among the respondents over the past six months, it is understood that musculoskeletal issues (3.24) were the major health issues among respondents, followed by headaches (3.16) and injuries and cuts

(3.15). It is also understood that most respondents had a moderate health status (64.2 per cent).

- The analysis of healthcare practices among the respondents during the health issues revealed that visiting government hospitals for treatment was the primary way to treat their health issues (3.21 mean value), followed by visiting private hospitals (2.79 mean value).
- A majority of the respondents, i.e. 256 employees (76.4 per cent), had the habit of unhealthy substance usage, with betel leaf consumption being the most prevalent, followed by tobacco consumption. Alcohol consumption was more common among male employees, while women primarily consumed betel leaves. Notably, 146 employees (56.6 per cent) reported using these unhealthy substances as a coping mechanism for unpleasant work conditions.
- The analysis of health implications of work shows that a majority, 49.6 percent of the respondents perceive their work slightly contributes to their health issues, followed by 33.7 per cent believe work strongly contributes to their health issues.

13.6 Challenged faced by the employees

- Five factors were derived using principal component analysis while examining the challenges encountered by respondents. These factors named as, challenges related to work safety, challenges related to financial security, challenges related to job security, challenges related to employees' well-being, and challenges related to public perception. The primary challenges encountered by respondents were related to work safety factors. This includes the absence of welfare facilities (factor loading 0.804), absence of sanitation facilities (factor loading 0.777), harassment at the workplace (factor loading 0.728), discomfort with using personnel protective equipment supplied at the workplace (factor loading 0.680), pressure of finishing the task without timely rest and food intake (factor loading 0.609), mental stress due to poor working conditions(factor loading 0.498), disrespect and neglect by urban local body (factor loading 0.456), and bad smell of waste (factor loading 0.443).
- Further, it was found that a majority of respondents, i.e. 170 employees (50.7 per cent), reported that they experience a high level of challenges. The results show that the respondents face a high level of challenges in their work and social lives, and these challenges need proper attention.

- An examination of variations in challenges faced by employees across their employment types, namely permanent, direct payment, and contract employment modes, using the Fisher exact test, revealed a statistically significant impact of employment type on employees' challenges. It revealed the impact of the type of employment held by the employees on the challenges they face. The Key factors contributing to these variations include challenges related to financial security, challenges related to well-being, and challenges related to public perception.

13.7 Findings on alternative livelihood strategy of respondents

- Regarding the alternative livelihood strategies of respondents, it is found that engaging in other income-generating activities to supplement earnings from primary livelihood activity was the major alternative strategy among respondents (mean value of 3.5), followed by joining the association and social groups to seek protection and support against unwanted happening in life (mean value of 3.1).
- The analysis of overall adoption rate of alternative livelihood strategies among the respondents revealed that, a majority of the respondents, i.e. 217 employees (64.8 per cent), had a low level of alternative livelihood strategies adoption rate, which is evidenced by a mean value of 2.75. This suggests that the adoption rate of alternative livelihood strategies among MSWM employees was found to be low, with non-permanent employees having higher adoption rates than permanent employees.

13.8 Findings on respondents' access to external support system

- Regarding respondents' access to external support systems, it is observed that respondents had fair access to essential services such as public infrastructures, housing, health care, and education (mean value of 3.7). However, their viewpoints were often overlooked in policy formulation (mean value of 2.2), and they rarely received support from NGOs or other community-based organizations (mean value of 2.2). This lack of representation and external support hampers their ability to voice concerns, participate in decision-making processes, and access resources that could improve their socio-economic well-being.
- The analysis of the overall adoption rate of alternative livelihood strategies among the respondents revealed that a majority of respondents, i.e. 244 employees (72.8 per

cent) had low access to external support systems with a mean score of 2.70. This suggests that respondents had low access to external support systems.

13.9 Finding on livelihood sustainability of respondents

- The analysis of human capital sustainability among respondents shows that a majority of the respondents, i.e. 244 employees (72.8 per cent), had a low human capital sustainability with a mean value of 2.79. This indicates that the civic employees engaged in solid waste management in Dakshina Kannada had low human capital sustainability. This low human capital sustainability of the respondents is majorly attributed to their poor access to health services, their limited awareness of available schemes (mean value 2.8), insufficient awareness of available schemes (mean value 2.4), and challenges in accessing education and skill development opportunities for their skill upgradation (mean value 2.6), and their challenges in accessing education and skill development opportunities for skill upgradation.
- The analysis of social capital sustainability among respondents shows that a majority of the respondents, i.e. 51.1 per cent of the respondents (171 employees) had 'high' social capital sustainability with a mean value of 3.1. This indicates that an average civic employee engaged in SWM in Dakshina Kannada has high social capital sustainability. This high social capital sustainability is mainly attributed to variables such as active participation in group activities (mean value 3.6), robust support from neighbours, and family and friends during emergencies (mean value 3.2).
- The analysis of natural capital sustainability among respondents shows that a majority of the respondents, i.e. 247 employees (73.7 per cent) had high natural capital sustainability with a mean value of 3.31. This indicates that an average civic employee engaged in solid waste management in Dakshina Kannada has high natural capital sustainability. The high natural capital sustainability of the respondents is majorly attributed to elements such as respondents' ability to reside in disaster-free (mean value 3.7) and pollution-free areas (mean value 3.6). However, respondents' access to land resources was found to be very low, which is a serious concern.

- The analysis of physical capital sustainability among respondents shows that a majority of the respondents, i.e. 190 employees (56.7 per cent) had high physical capital sustainability with a mean value of 3.2. This indicates that civic employees engaged in solid waste management in Dakshina Kannada have a high physical capital sustainability. This high physical capital sustainability is attributed to factors, such as their fair access to public infrastructure (mean value 4.0), ability to have satisfactory housing conditions (mean value 3.7) and their access to work-related equipment (mean value 3.5).
- The analysis of financial capital sustainability among respondents shows that a majority of the respondents, i.e. 204 employees (60.9 per cent) had high financial capital sustainability with a mean value of 3.2. This indicates that the civic employees engaged in solid waste management in Dakshina Kannada had high financial capital sustainability. This high financial capital sustainability is majorly attributed to factors such as respondents' sufficient earnings to meet their commitments (mean value of 3.5) and sufficiency of saving (mean score 3.4). However, their access to credit facilities is low, which limits their financial capital sustainability to some extent.
- The overall livelihood sustainability of the respondents is found to be high, with a mean value of 3.15. The high livelihood sustainability of the respondents is attributed to variables such as social, natural, physical, and financial capital sustainability.
- The association between working conditions and the five components of livelihood sustainability: human, social, natural, physical, and financial sustainability, was found to be positive and significant. Further, the association between working conditions and overall livelihood sustainability was found to be positive and significant. Thus, the working conditions of the MSWM employees significantly influence their livelihood sustainability. Employees with favourable working conditions are more likely to experience higher levels of livelihood sustainability.
- The association between the alternative livelihood strategies of respondents and their livelihood sustainability was found to be positive and significant. Therefore, it can also be inferred that the alternative livelihood strategies of respondents help them achieve livelihood sustainability.

- The association between respondents' access to external support systems and livelihood sustainability was found to be positive and significant. Hence, it can also be inferred that employees with good access to external support systems are more likely to have a higher level of livelihood sustainability.

13.10 FINDINGS BASED ON THE HYPOTHESIS

13.10.1 Hypothesis 1:

H0: Low education and poverty are not the primary reasons as to why employees enter solid waste management work.

H1: Low education and poverty are the primary reasons as to why employees enter solid waste management work.

To find out the primary reasons for employees' entry into SWM work out of 11 reasons a Principal Component Analysis was used. The results of which presented in the following table-

Table 4: Primary reasons for employees' entry into SWM identified using Principal Component Analysis

Variables	Components		
	1	2	3
Low education	.782		
Pressure of debt	.762		
Poverty at home	.750		
Background (parental background)	.713		
To have financial independence	.705		
Work convenience		.868	
Dint get other work		.830	
Compensatory appointment		.518	
To have regular income			.833
With the hope of job permanency			.563
Institutional pulling reasons			.517
% of variance	31.4%	15.5%	12.02%

KMO = .700 >0.05

Bartlett's Test of Sphericity …… .000 < 0.01

Source: computed by researcher

Interpretation: From the above table it was found **the primary reason respondents joined SWM work is due to socio-economic factors**. It consists of variables like low education (factor loading 0.782), poverty at home (factor loading 0.762), the pressure of debt (factor loading 0.750), parental background (factor loading 0.713), and financial independence (factor loading 0.705) in which low education and poverty have highest factor

loading. So the hull hypothesis (H0) is rejected and null hypothesis accepted. It is inferred that illiteracy and poverty are the primary reasons why employees enter the SWM work as a livelihood option.

13.10.2 Hypothesis 2:

H0: There is no difference in the working conditions of civic employees engaged in solid waste management across different employment types.

H1: There is a difference in the working conditions of civic employees engaged in solid waste management employees across different employment types.

To investigation has been carried out to see whether the working conditions of the employees engaged in the MSWM differ across their employment types. A Chi-squared test was used for this purpose, and the results are shown in Table 5.

Table 5: Chi-squared test results for the impact of employment types on working conditions

Variable	Employment types under employees working			
	chi-square value	**d.f**	**p**	**Result**
Woking condition	63.086	2	0.005**	**Highly Significant**

Source: *Primary Survey data*

Note*: ** Denotes p-value is significant at a 5 % level of significance*

Table 4.31 shows the results of a chi-squared test for the impact of employment types on the working conditions of the respondents. Since the p-value for the variables is less than 0.05, the null hypothesis is rejected at the 5 % significance level, and hence the alternative hypothesis is accepted. It indicates a significant impact of employment types on the working conditions of employees. Therefore, it is inferred that there is a significant variation in the working conditions of civic employees engaged in SWM across their employment types. This signifies that the work conditions for MSWM employees vary across their employment types (Permanent, Direct Payment, and Contract).

13.10.3 Hypothesis 3

H_0: There is no difference in the challenges faced by civic employees engaged in solid waste management across the employment types.

H_1: There is a difference in the challenges faced by civic employees engaged in solid waste management across the employment types.

An investigation has been carried out to see whether the challenges faced by employees engaged in the MSWM differ across their employment types. A Fisher's exact test was used for this purpose, and the results are shown in Table 6.

Table 6: Fisher's exact test results for the impact of employment type on Challenges faced by employees

Variable	Employment types under employees working		
	d.f	**p**	**Result**
Challenges faced by the employees	2	0.000**	**Highly Significant**

Source: *Primary Survey Data*

Note*: ** Denotes p-value is significant at a 5 % level of significance*

Fisher's exact test result for the impact of employment types on challenges experienced by the respondents is presented in Table 4.45. Since the p-value for the variables is less than 0.05, the null hypothesis is rejected at the 5 % significance level, and hence the alternative hypothesis is accepted. It indicates a significant impact of employment types on the challenges experienced by the employees. Therefore, it is inferred that there is a significant variation in the challenges experienced by the civic employees engaged in SWM across their employment types. This signifies that the challenges experienced by MSWM employees vary across their employment types (permanent, direct payment, and contract).

13.10.4 Hypothesis 4

H_0: There is no association between working conditions and livelihood sustainability of civic employees engaged in solid waste management.

H_1: There is an association between working conditions and livelihood sustainability of civic employees engaged in solid waste management.

For examining hypothesis 4, the 'Pearson correlation coefficient matrix' was used. The results of the test are presented in Table 7.

Table 7: Association between Working Conditions and Livelihood Sustainability of respondents

Correlation analysis				Result
Working conditions				
	N	Correlation	p	
Human capital sustainability	335	0.366	.000**	**Highly Significant**
Social capital sustainability	335	0.339	.000**	**Highly Significant**
Natural capital Sustainability	335	0.313	.000**	**Highly Significant**
Physical capital Sustainability	335	0.421	.000**	**Highly Significant**
Financial Capita sustainability	335	0.342	.000**	**Highly Significant**
Livelihood sustainability	**335**	**0.548**	**.000****	**Highly Significant**

***Source**: Primary Survey data*

***Note**: ** Denotes p-value is significant at a 5 % level of significance*

Table 4.61 shows the Pearson correlation coefficient, results for the association between working conditions and livelihood sustainability of respondents. Since the p-value for the variables is less than 0.05, the null hypothesis is rejected at the 5 % significance level, and hence the alternative hypothesis is accepted. It denotes a significant association between the working conditions and the livelihood sustainability of the respondents. The association was positive, indicating that these two variables move in the same direction. Hence, it is inferred that the respondents with good working conditions likely have more livelihood sustainability.

13.10.5 Hypothesis 5-

H_0: There is no association between alternative livelihood strategies and livelihood sustainability of civic employees engaged in solid waste management.

H_1: There is an association between alternative livelihood strategies and livelihood sustainability of civic employees engaged in solid waste management.

To examine the association between alternative livelihood strategies and livelihood sustainability of respondents, the 'Pearson correlation coefficient matrix' was used. The results of the examination are presented in Table 8.

Table 8: Association between Alternative Livelihood Strategies and Livelihood Sustainability of respondents

Correlation analysis				Result
Alternative Livelihood strategy				
	N	Correlation	P	
Livelihood sustainability	335	0.294	.000**	**Highly Significant**

***Source**: Primary Survey data*

***Note**: ** Denotes p-value is significant at a 5 % level of significance*

The Pearson correlation coefficient, as shown in Table 4.62, for the association between alternative livelihood strategies and livelihood sustainability of respondents is 0.294 ($p < 0.05$). Since the p-value for the variables is less than 0.05, the null hypothesis is rejected at the 5 % significance level, and hence the alternative hypothesis is accepted. It signifies a significant association between the alternative livelihood strategies and livelihood sustainability of respondents. The positive association indicates that these two variables move in the same direction. Hence, it is inferred that the alternative livelihood strategies of respondents help them to achieve higher livelihood sustainability.

13.10.6 Hypothesis 6-

H_0: There is no association between external support system access and livelihood sustainability of civic employees engaged in solid waste management.

H_1: There is an association between external support system access and livelihood sustainability of civic employees engaged in solid waste management.

To examine the association between external support system access and the livelihood sustainability of respondents, the 'Pearson correlation coefficient matrix' was used. The results of the examination are presented in Table 9.

Table 9: Association between External Support System Access and Livelihood Sustainability of respondents

Correlation analysis				**Result**
Access to external support system				
	N	Correlation	P	
Livelihood sustainability	335	0.505	.000**	**Highly Significant**

***Source**: Primary Survey data*

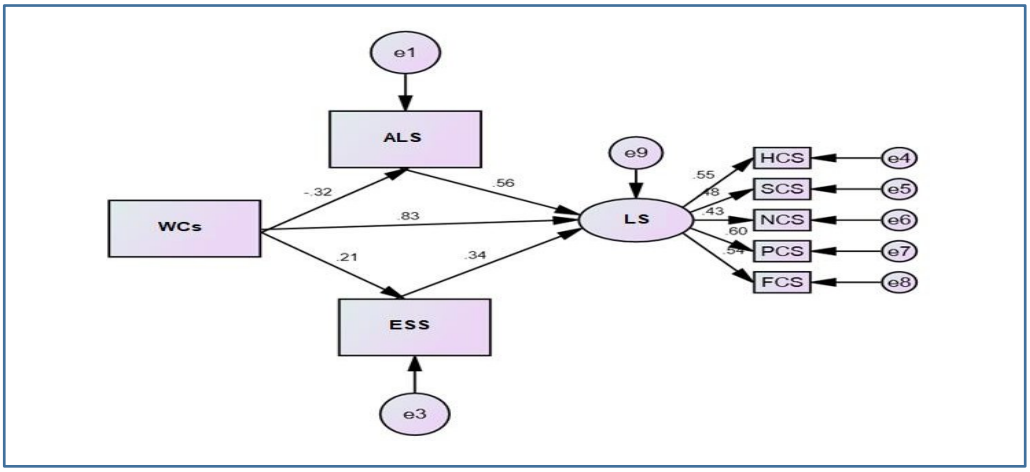
***Note**: ** Denotes p-value is significant at a 5 % level of significance*

The Pearson correlation coefficient, as shown in Table 4.65, for the association between external support system access and livelihood sustainability of the respondents is 0.505 ($p < 0.05$). Since the p-value for the variables is less than 0.05, the null hypothesis is rejected at the 5 % significance level, and hence the alternative hypothesis is accepted. The positive association indicates that two variables move in the same direction. Hence, favourable access to external support systems is inferred to help MSWM employees enhance their livelihood sustainability.

14 STRUCTURAL EQUATION MODELING

To evaluate the overall impact of SWM work on livelihood sustainability and factors having mediating effects on the livelihood sustainability of the employees engaged in it, SEM was carried out and the result shown in the figure 4.

Figure 4: Structural Equation Modelling (SEM)



14.1 Model Fit indices

Model fit indices are essential to ensure the accuracy of the model used in the study. The following table shows the values for model fit indices-

Table 10 : Fit indicators of SEM

Fit indicators value	
Chi-square/d.f	0.000
GFI	0.960
AFGI	0.920
RMSEA	0.083
NFI	0.908
CFI	0.933

Interpretation of model fit indices

Several fit indices are used to test the good fit of the model in the above table. It is understood that the Chi-square test shows a p-value less than 0.05 which is non-significant to prove a model a good fit. Chi-square values are highly sensitive to sample size, especially if it indicates a poor mode fit in case of a large sample size which is considered a major limitation of Chi-square test value to measure model good fit (Yuan, 2005). If the Chi-square test value does not show a good fit for the model, it is necessary to test it using

alternative fit indices like GFI, AFGI, RMSEA, NFI, and CFI. From the table it is observed that the values for GFI, AFG, NFI, and CFI are higher than 0.90, indicating a good fit of the model. Additionally, the RMSEA value falls between 0.08 and 0.09, reflecting an acceptable level of fit. Overall, these fit indices suggested that the model provides an acceptable approximation of the observed data.

14.2. Regression weights and Standardized Regression Weights

Observing the values of Regression weights and Standardized Regression is important to understanding the specific impacts of variables. The following table shows Regression weights and Standardized Regression values -

Table 11: Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
LS	<---	WC	-.451	.072	-6.240	***	par_1
PIP	<---	WC	.283	.073	3.862	***	par_2
Sustainability	<---	LS	.242	.022	11.274	***	par_3
Sustainability	<---	PIP	.154	.021	7.256	***	par_4
Sustainability	<---	WC	.494	.030	16.615	***	par_5

Table 12: Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
LS	<---	WC	-.323
PIP	<---	WC	.207
Sustainability	<---	LS	.432
Sustainability	<---	PIP	.269
Sustainability	<---	WC	.632

14.4. Interpretation for the variables considered in the model

Interpretation for the variables considered in the SEM model presented in Table 13**.**

Table 13: Interpretation for the variables in the SEM model

Test variables	**Direct effect**	**Indirect effect**	**Total Effect**	**Result**
Working conditions ⇒ Livelihood Sustainability	0.632**	0.109	0.723**	Working conditions positively impact the livelihood sustainability of civic employees engaged in SWM. This indicates better the working conditions higher the livelihood sustainability to the employees.
Working conditions ⇒ Alternative Livelihood strategy	-0.323**	0.000	-0.323**	There is a negative impact of working conditions on the alternative livelihood strategy adopted by the civic employees engaged in SWM. This indicates working conditions impact the livelihood strategy adoption level of employees engaged in MSWM.
Working conditions ⇒ External support system	0.207**	0.000	0.207**	There is a positive association between the working conditions and the external support system prevails to the civic employees engaged in

				SWM. This indicates positive provide a favourable external support system to the employees.
Alternative Livelihood Strategies → Livelihood Sustainability	0.432**	0.000	0.432**	There is a positive impact of Alternative Livelihood Strategies on the Livelihood Sustainability of the civic employees engaged in SWM. This indicates alternative livelihood strategies help the employees to attain higher livelihood sustainability
External Support System → Livelihood Sustainability	0.269**	0.000	0.269**	There is a positive impact of External Support System on the Livelihood Sustainability of the civic employees engaged in SWM. This indicates External Support System help the employees to attain higher livelihood sustainability

**significant at 5% level of significance

Interpretation: Solid waste management work (working conditions) is the major factor that contributes positively towards the livelihood sustainability of employees engaged in it. The livelihood sustainability of civic employees engaged in SWM is directly dependent on their main livelihood strategy which is SWM. In addition, alternative livelihood strategies undertaken by civic employees engaged in SWM and external support systems accessible to them have an impact on their livelihood sustainability but the impact is too small.

15 SUGGESTIONS

Based on the present research work, a few suggestions were identified, which are presented below.

15.1 Suggestions to the employees engaged in solid waste management

Regardless of the support from the government or the society, the real success of any initiative or measure depends on the individual's perception and attitude. Therefore, the following suggestions are given to employees.

- The proper use of personal protective equipment among solid waste management employees is crucial for safeguarding their health and well-being. However, it has been observed that many workers either do not use personal protective equipment correctly or neglect it altogether, exposing themselves to harmful waste, toxic substances, and infectious diseases. This not only heightens health risks but also compromises overall workplace safety and efficiency. Therefore, it is essential for workers to **use safety protocols properly and consistently use protective equipment** to minimize occupational hazards.
- Handling waste exposes workers to harmful bacteria, viruses, and toxins, which can enter the body through the mouth or other contact points, causing serious illnesses. Regular hand washing with soap or disinfectant immediately after waste handling is essential to reducing health risks and preventing infections. Therefore, **employees should make it a priority to wash their hands after work and before meals to safeguard their health and well-being**.
- Regular medical check-ups are essential for solid waste management employees to detect and prevent potential occupational diseases early. It has been observed that all urban local bodies in Dakshina Kannada conduct medical check-up camps for solid waste management workers at least twice a year. These health check-up camps would be more effective if workers openly discuss their health concerns with medical professionals, allowing for early intervention and better management of any emerging conditions. Therefore, it is crucial for **workers to communicate openly about their health issues** with medical professionals.
- The study observed that employees contribute significantly to government mandated funds, such as provident funds, their personal savings outside of these compulsory contributions are limited. Therefore, it is crucial for workers to **adopt**

disciplined saving habits and consider various investment options to secure their financial situations in future.

- Skills upgradation is a crucial strategy for enhancing employment opportunities. The National Safai Karmacharies Finance and Development Corporation offers various vocational training programs to help sanitation workers develop new skills. However, the study found that the utilisation of these schemes among employees remains significantly low. Therefore, employees should actively **participate in vocational skill development programs** to expand their career prospects and secure better opportunities.
- Proper utilisation of government schemes is essential for improving the livelihood opportunities of employees. Various programs, including educational support schemes, skill development initiatives, and entrepreneurial programs, are initiated by state agencies and National Safai Karmacharies Financial and Development Corporation to help individuals enhance their skills and economic prospects. However, the study observed low awareness and underutilization of these schemes among employees, limiting their upward mobility and growth opportunities. To address this, **employees should actively seek information, understand the benefits of these programs, and make full use of them to secure a better future**.
- Skill acquisition training programs, term loan schemes, and the Swachh Udyami initiative under the National Safai Karamcharis Finance and Development Corporation provide essential support to solid waste management employees and their dependents for entrepreneurial development. Numerous success stories showcase how trained workers have effectively utilised these schemes to transition into entrepreneurship and build sustainable ventures. Therefore, **employees should actively explore these opportunities to secure a stable and self-reliant future**.
- The study observed that some employees perceive their occupation as a secure option for their children, encouraging them to take up this work while discouraging their education. This limits the children's opportunities for upward mobility and skill development, which is detrimental to their future. Therefore, **employees need to get over this mindset**.

- Encouraging children's education and skill development is essential for improving future livelihood opportunities. The survey revealed that some employees denied their children education due to financial constraints, despite the availability of specialised financial assistance programs at the ULB, state, and central (NSKFDC) levels. However, as a researcher, it has been personally observed that beyond financial limitations, the lack of genuine motivation and encouragement within the family environment is a major constraint on children's education. To address this, **employees should actively prioritise their children's education and create a supportive atmosphere that truly inspires them to pursue learning** and skill development.
- It is observed that some employees obtain membership in respective associations and groups only for name's sake, without actively engaging in key activities or decision-making while addressing major issues. This attitude limits the effectiveness of collection action. Therefore, **employees must actively engage in these associations and groups to maximize the benefits**.
- Sanitation employees should **organise monthly union meetings** to discuss their concerns and workplace challenges. Regular meetings provide a platform to address grievances and advocate for better working conditions. Strengthening union participation can help improve their rights, welfare, and overall job satisfaction.

15. 2 Suggestions to the government

The government is a major stakeholder in the MSWM system, and hence, people involved in MSWM are associated with the government. Ensuring the well-being of those engaged in MSWM is thus considered a major responsibility of the government. Suggestions to the government based on studies on employees engaged in MSWM can offer valuable insights for improving employees' conditions. Therefore, the following suggestions are given to the Government.

- Based on the study results, it is highly felt that the government needs to **promote children's education** among the respondents. Illiteracy and parental backgrounds were found key reasons for employees entering this work, with most belonging to the historically marginalised SC castes, which are often forced into sanitation-related tasks. Without proper interventions, their children may follow the same

path as their parents and continue in the same occupation that has exploited their community for generations in various ways. Therefore, serious efforts should be undertaken by the government to support the education of children and employees engaged in solid waste management.

- From the study, it is evident that providing good working conditions for civic employees engaged in solid waste management is crucial for their livelihood betterment. The majority (67.5 per cent) of MSWM employees report bad working conditions. The study identifies solid waste management work as a main livelihood strategy of employees engaging in it and a direct positive association between working conditions and livelihood sustainability, indicating bad working conditions negatively impact the livelihood sustainability of these employees. Therefore, urgent action by the government is needed to improve the working conditions of these employees with a special focus on employee training and development, conduct of awareness programs, and implementation of robust issue resolution mechanisms.
- The study observed a clear disparity in the working conditions among employees under different employment types. Therefore, the government is advised to **reduce the workplace disparity** between employees belong to different employment types by ensuring that basic workplace essentials are provided equally to all employees, regardless of their employment types. These essentials include standardised working hours, job security, issue resolution procedures, sanitation facilities, welfare facilities such as restrooms and drinking water.
- As the majority of the respondents were unhappy about the safety training, the **government needs to focus on the provision of proper training** to help employees be equipped with the necessary skills to perform their tasks safely and protect their health.
- The government introduced various schemes and policies to protect municipal solid waste management employees' interests and improve their well-being. However, due to limited reach, it fails to attain its goal. Therefore the **government, needs to undertake awareness programs to make the employees** aware of the policies and schemes applicable to them to help them effectively utilise these policies and schemes.

- Sanitation workers play a critical role in the well-being of society. However, societal perceptions of these employees are often negative. To address this, the **government should foster a more positive public perception of sanitation workers through undertaking awareness campaigns**. Events like Paura Karmika Diwas should not be limited to local body officials. Still, they should involve the broader public, allowing them to witness the valuable contributions of these workers and encouraging a shift in public opinion.
- It has been noted that many Urban Local Bodies (ULBs) in Dakshina Kannada face a shortage of MSWM employees compared to what is required, which negatively affects workers' health and wellbeing. Since solid waste management is a physically demanding task, this manpower shortage may force the available employees to take on extra pressure to complete their work. As a result, they may engage in unhealthy practices, such as standing on the sides of trucks, skipping meals, and neglecting hygiene. Therefore, the **government should prioritise filling the vacant positions** to reduce the unnecessary pressure on workers.
- The study observed that employees engaged in solid waste management have issues with the quality of personal protective equipment (PPE), particularly gloves, which tear easily, are unsuitable for handling wet waste, and often cause a burning sensation. Additionally, inadequate equipment, such as low-quality brooms, forces employees to spend money on replacements. These issues pose significant health risks and financial burdens, ultimately reducing workers' quality of life. Therefore, the government **should prioritise providing standardised tools and high-quality safety equipment** to improve working conditions and workers' well-being.
- In some municipalities, employees engaged in solid waste management must travel long distances to fulfill their work responsibilities, often bearing travel expenses themselves. For instance, street sweepers from Someshwara Town Council travel to Deralakatte, 8 km away, using their own vehicles, which adds to their financial strain. This additional burden worsens their economic hardships, making it unjust for them to cover work-related travel costs. The government should address this issue by **providing travel allowances or arranging proper transportation to support these workers**.

- The study found that existing schemes and policies fail to adequately benefit MSWM employees, possibly due to their limited representation in decision-making. To address this, the **government should actively involve employees' associations in policy discussions and provide workers with opportunities to openly voice their concerns** about these schemes. Considering their viewpoints when framing major laws and policies will lead to more effective and inclusive reforms.
- NGOs like Plastic for Change, Hasiru Dala, and Ramakrishna Mission are actively working to improve the lives of employees engaged in waste management through various initiatives. These organizations focus on skill development, occupational safety, healthcare access, and social inclusion. Given their significant contributions, the **government should make concerted efforts to identify and collaborate with such institutions to implement programs focused on skill development and the overall well-being of employees**.

15.3 Suggestions to the society

Offering suggestions to society is essential because MSWM employees work within the community and for the good of society. Therefore, society's role is significant in improving MSWM employees' conditions. The following suggestions are given to the Society -

- The **public should responsibly manage their household waste**. This means proper maintenance and handing over garbage to employees in a manner that does not pose any direct health risks to them. This includes properly wrapping broken glass and other hazardous waste material securely, informing the waste collector about it if possible, and ensuring that waste is placed out for collection in a timely manner.
- Employees engaged in solid waste management work are crucial in maintaining public health and hygiene and ensuring clean and liveable environments for communities. Their work holds significant social value but often faces challenging conditions and inadequate recognition. **Society should acknowledge their contributions, show respect for their efforts**, and actively support initiatives that improve their working conditions and overall well-being.

- Solid waste management work is labour-intensive and physically demanding, often requiring workers, especially street sweepers and waste collectors to walk long distances. Despite their vital role in maintaining public cleanliness, they frequently face disrespect when requesting basic necessities like water or rest from households during their work. Some workers have reported being directed to toilets or given water in unhygienic ways, such as from a toilet mug. These kinds of actions that reflect deep-seated discrimination and a lack of respect for their work. This attitude of households must be changed to uphold the dignity and humanity of solid waste management workers.
- **Felicitation of solid waste management workers at the community level** serves as a powerful motivation, recognising their invaluable contribution to public health and cleanliness. Such gestures not only boost their morale but also foster a sense of dignity and respect for their work. Society should actively involve in honouring solid waste management workers to eliminate biases and promote positive perception among the society regarding the workers.
- A significant number of solid waste management employees live in poor conditions, struggling with inadequate access to basic necessities. Small initiatives, such as **donating essential amenities like hygiene products and stationery** for their children, can greatly improve their well-being and create better opportunities for their families. With collective efforts from individuals and communities, such support can make a meaningful difference in uplifting their living standards.

16 DIRECTIONS FOR FUTURE RESEARCH

The study is confined to employees working in SWM within ULBs in Dakshina Kannada district only. A broader study could include the entire workforce engaging in solid waste management across Karnataka. Additionally, a comparative analysis of solid waste workers across the different districts within the state could provide valuable insights.

A comprehensive study could encompass both formal and informal employees engaged in Solid Waste Management (SWM). This would provide a holistic understanding of the sector's diverse workforce, highlighting each group's varying conditions, challenges, and contributions.

A study can be done focusing on employees working in SWM within rural local bodies, as this setting may offer unique challenges and opportunities that differ from urban contexts. By examining the experiences and conditions of these employees, the study can shed light on how rural dynamics influence their work environment and livelihood sustainability.

Discrimination in the workplace against employees from lower castes is a significant concern that demands thorough investigation due to its substantial impact on social equity and economic progress. Exploring the real-life experiences of these employees can provide meaningful insights into social dynamics and related challenges and help identify the specific barriers they face in their occupational roles.

17 CONCLUSIONS

Waste is a byproduct of urbanisation, and its effective management is essential for a healthy environment and society. Despite the significant challenges waste poses, individuals join the waste management sector for various reasons and depend primarily on it for their livelihoods. Employees engaged in solid waste management in Dakshina Kannada come from diverse socio-economic backgrounds, with many being young adults and a nearly equal representation of men and women, though slightly male-dominated. Education levels are generally low, with most workers having minimal or no formal education, reinforcing the link between limited educational opportunities and engagement in solid waste management work. A significant portion of employees belongs to scheduled castes and scheduled tribes, highlighting the continued influence of caste in shaping occupational choices. Family structures are largely nuclear, and financial vulnerability is evident, with most workers falling under the below-poverty line category and depending on government support for sustenance. Migration trends indicate that both local and migrant workers participate in the sector, with many relocating from neighbouring districts and states in search of livelihood opportunities.

Living conditions show that while most workers own land, their holdings are small and often acquired through government schemes. A significant proportion resides in urban areas, mostly in rented houses, reflecting the challenges faced by migrant workers in securing stable housing. Basic amenities like electricity, LPG, and municipal water supply are widely accessible, but some workers still face issues related to inadequate

sanitation, drainage, and limited rooms in their homes. Financial constraints limit their ability to own high-value household assets, with basic appliances being the most commonly owned. Expenditure patterns indicate that a large portion of income is spent on necessities like food, housing, and debt repayment, over healthcare and education, underscoring economic hardship. Regarding saving, mandatory and voluntary savings practices show a degree of financial planning among workers despite the prevalence of debt, primarily taken for housing purposes.

In terms of employment, a majority of solid waste management workers are engaged on a non-permanent basis, with contracting being the dominant mode of employment. Most workers are involved in street sweeping roles, which are labour-intensive and demand physical endurance. Work experience is relatively short, reflecting the sector's reliance on temporary labour. Wages remain low, with most workers earning below rupees 20,000 per month despite long working hours. The lack of overtime compensation further exacerbates financial strain. Socioeconomic factors such as low education, debt pressure, parental background, and poverty are the primary drivers for entering solid waste management work.

The working conditions of solid waste management employees are found to be poor, characterised by unfair working hours, unfair salary system, low job security, lack of welfare facilities, inadequate workplace issue resolution procedure, low job recognition, inadequate leave facilities, and limited career growth opportunities at the workplace. The nature of employment significantly impacts working conditions, with non-permanent workers facing greater challenges. Health implications are severe, with musculoskeletal issues, headaches, injuries, and cuts being common. Most workers perceive their jobs as detrimental to their health, and they rely primarily on government hospitals for treatment, in contrast self-medication or neglecting medical issues also follow during health issues that indicate gaps in healthcare accessibility. Alcohol consumption is prevalent and often used as a coping mechanism for workplace stress.

The study identifies five key challenges faced by workers: work safety hazards, challenges related to financial security, challenges related to job security, challenges related to employees' well-being, and challenges related to public perception. Non-permanent employees are particularly vulnerable to these challenges, which significantly

impact their job satisfaction and overall well-being.

Workers experiencing poor conditions are more likely to seek alternative livelihood strategies, indicating dissatisfaction with their current employment. Employees' access to external support systems remains limited, with workers having little involvement in policy-making processes and receiving minimal community support. However, the study finds a strong link between better working conditions and improved access to external support systems, emphasising the need for enhanced labour rights and social inclusion.

Despite these challenges, livelihood sustainability among solid waste management employees is relatively high, supported by manageable financial situations, strong social networks, alternative livelihood strategies, and external support systems. While social, physical, financial, and natural capital remain strong, human capital is notably low due to poor health services, limited awareness of welfare schemes, and restricted access to skill development opportunities. The study underscores that improved working conditions, better access to external support, and the adoption of alternative livelihood strategies play a crucial role in enhancing the overall sustainability of their livelihoods.

Overall, employees engaged in solid waste management in Dakshina Kannada demonstrate resilience in sustaining their livelihoods, their well-being is severely impacted by job insecurity, poor working conditions, and health risks. Addressing these issues through policy interventions, improved employment conditions, better healthcare access, and skill development programs is crucial for enhancing their quality of life. Ensuring job security, fair wages, and social welfare support will be key to creating a sustainable and dignified livelihood for these workers.

18. REFERENCES

Adhikari, B. (2007). Street sweeping as a livelihood strategy of Pode community in KMC: Livelihood assets and vulnerabilities. 1-104. Tribhuvan University Central Department of Geography.

Afrin, T., & Islam, M. S. (2021). Exploring the livelihood pattern of the floating population using the SL framework: a case study of metropolitan Dhaka, Bangladesh. *Journal of the Asia Pacific Economy, 28*(1), 284--313.

Ali, A. N., Begum, F., Salehin, M. M., & Farid , K. S. (2008). Livelihood pattern of rural women

garment workers at Dhaka city. *Journal of the Bangladesh Agricultural University, 6*(2).

Annepu, R. K. (2012, January 10). Sustainable Solid Waste Management in India. *Sustainable Solid Waste Management in India*.

Anusuya, C., & Kavitha, A. (2019). Morbidity pattern on street sweepers in Rajapalayam Taluk. *International Journal of Advance Research and Innovative Ideas in Education (IJARIIE), 5*(4), 276-91. doi:16.0415/IJARIIE-10535

Arjun, K. (2023). Status of Sanitation Workers: A Case Study of Kathmandu Valley. *Voice of Teacher, 8*(1), 1-15.

Balasubramanian, T., & Pillai, M. J. (2021, June). Working conditions of sanitary workers in Nagercoil Municipal Corporation. *Journal of Emerging Technologies and Innovative Research, 8*(6), 261-267.

Banu, N., & Fazal, S. (2017). A pragmatic assessment of livelihood status in the peri-urban interface: a case from developing India. *ASIAN GEOGRAPHER*, 1-24. Retrieved from 10.1080/10225706.2017.1296366

Belarmino, V. B., Pagani, M. E., Tanouye, d. A., Garcia, L. F., & Massuda, E. M. (2022). Perception of work and health among waste collectors. *Rev Bras Med Trab, 20*(4), 574-581. doi:10.47626/1679-4435-2022-795

Chambers, R., & Conway, G. R. (1991, December). Sustainable rural livelihoods: practical concepts for the 21st Century. *Sustainable rural livelihoods: practical concepts for the 21st Century*. Institute of Development Studies.

Chellamma, P., Sudhiraj, & Vijayakumar, A. (2015, November 5). Morbidity profile of sanitary workers in Trissur Corporation, Kerala. *Journal of Evolution of Medical and Dental Sciences, 4*(89), 15468-15469.

DalbergAdvisors. (2017). Sanitation worker safety and livelihoods in India: A blueprint for action.

New Delhi: Dalberg Advisors.

Das, F. (2019). Sustainable livelihood of fishing allied workers A study of the south coastal region of Kerala. *Sustainable livelihood of fishing allied workers A study of the south coastal region of Kerala*. Shodhganga. Retrieved from https://shodhganga.inflibnet.ac.in/handle/10603/392998

Dasgupta, S., Bandyopadhyay, K. K., Dwivedi, A., DasGupta, S., & Bharti. (2023). Sanitation Work and Workers. *Social Innovations in Urban Sanitation in India*, 69-85.

DFID. (1999). Sustainable livelihoods guidance sheets. Retrieved from

https://www.livelihoodscentre.org/documents/114097690/114438878/Sustainable+livelihoods+guidance+sheets.pdf

Dias, S. (2011). *Integrating informal workers into selective waste collection: the case of Belo Horizonte, Brazil*. WIEGO Policy Brief (Urban Policies).

Dwivedi, A., Kumar, A., & Dasgupta, S. (2023). *Understanding enablers & barriers to social protection of sanitation workers*. Centre for Policy Research. New Delhi: Centre for Policy Research.

Farrington, J., Ramasut, T., & Walker, J. (2002). Sustainable Livelihoods Approaches in Urban Areas: General Lessons, with Illustrations from Indian Cases. *Overseas Development Insitute, London*, 1-53.

Frankenberger, T. R., & McCaston, M. K. (1998). The household livelihood security concept.

Food Nutrition and agriculture, 30-35.

Government of Karnataka. (2022). *Human development report- 2022*. Human development division, planning, programme monitoring and statistics department, Government of Karnataka. Retrieved from https://planning.karnataka.gov.in/storage/pdf-files/Reports/HumanDevelopmentReport-2022FullBook.pdf

Government of Karnataka (2023). *Economic survey of karnataka 2022-23*. Government of Karnataka.

H, I., I, D. M., & S, A. A. (2022, November). Evaluation of livelihood status of Fadama iii tomato farmers in Kano state, Nigeria. *Journal of Agripreneurship and Sustainable Development*, 32-44.

Hassan, M. M., Farah, N., Afzal, S., Safian, A., & Hussain, S. (2021, July). A Study on Occupational Health Hazards of Sanitation Workers in District Multan, Pakistan. *International Journal of Current Research and Review*, *13*(13), 222-232.

National Statistical Office, Ministry of Statistics and Programme Implementation, India (2020). Household social consumption on education in India: NSS 75th Round, July 2017--June 2018. *Household social consumption on education in India: NSS 75th Round, July 2017--June 2018*. National Statistical Office, Ministry of Statistics and Programme Implementation.

Israel, G. D. (1992). Determining sample size. The Institute of Food and Agricultural Sciences (IFAS).

Jayakrishnan, T., Jeeja, M. C., & Bhaskar, R. (2013, November 29). Occupational health problems

of municipal solid waste management workers in India. *International Journal of Environmental Health Engineering, 2*(3), 1-6. doi:10.4103/2277-9183.122430

Khandare, L., & Salve, P. S. (2023). Examining Determinants of Health among Safai Karmacharis ("Ex-Untouchables" Caste) in Mumbai. *Social Development Issues, 44*(3).

Krantz, L. (2001). The Sustainable Livelihood Approach to Poverty Reduction. *SIDA. Division for Policy and Socio-Economic Analysis, 44*, 1-38.

Lakshmi, J. K., Nakkeeran, B., Murthy, S., Whittaker, L., Ramanamurthi, B., Sai, V., . . . Garimella, S. (2021, August 2). Health and well-being of waste workers in India. *Health and well-being of waste workers in India*. ARISE.

Lee, B.-J., Park, S.-G., Leem, J.-H., Kim, H.-C., Jeon, S.-H., Heo, Y.-S., . . . Min, J.-Y. (2014).

The relationship between working condition factors and well-being. *Annals of occupational and environmental medicine, 26*, 1-8.

Lenka, K. A. (2019, April). Health, Identity and Livelihood Status of Sanitation Workers in Bhubaneswar City, Odisha. *International Journal of Research and Analytical Reviews, 6*(2), 438-450.

Levine, S. (2014). How to study livelihoods: Bringing a sustainable livelihoods framework to life.

Lissah, S. Y., Ayanore , M. A., Krugu, J., & Ruiter , R. A. (2020, April 22). Psychosocial Risk, Work-Related Stress, and Job Satisfaction among Domestic Waste Collectors in the Ho Municipality of Ghana: A Phenomenological Study. *Int J Environ Res Public Health, 17*(8).

Livingston, S. A. (2018, January). Test Reliability—Basic Concepts. *Test Reliability—Basic Concepts*. Educational Testing Service (ETS).

M, R. K. (2020). *Job satisfaction of sanitary workers in tirunelveli district*. Retrieved from shodhganga.inflibnet.: https://shodhganga.inflibnet.ac.in/handle/10603/341906

Manyisa, Z. M., & Aswegen, E. J. (2017). Factors affecting working conditions in public hospitals: A literature review. *International journal of Africa nursing sciences, 6*, 28-38.

Mishra , A., Dodiya, I., & Mathur, N. (2012, October). An Assessment of Livelihood and Educational Status of Sanitation Workers in Ahmedabad, Gujarat. *Indian Institute of Management Working paper*, 1-13.

Morris, M., Lamboll, R., Butterworth, J., & Lazaro, E. (2001). Household livelihood strategies in semi-arid Tanzania: synthesis of findings. Annex A of the final technical report of project

R7805. DFID Project. *Natural Resource Institute, University of Greenwich, Chattam, 94*.

Nandimath, P. T., Rao, N. S., Subramaniyan, U., Mishra, B., Kalidindi, B. R., Shrivastava, R., . .. Pavan Kumar, H. V. (2019). Knowledge and practices of municipal solid waste workers: Findings from focused group discussions. *Waste Management and Resource Efficiency: Proceedings of 6th IconSWM* (pp. 287-298). Springer.

Nayak, S., Shenoi, , S., Kaur, G., Bisen,, N., Purkayastha, A., & Chalissery, J. (2013). Dermatologic Evaluation of Street Sanitation Workers. *Indian journal of dermatology, 58*(3), 246.

Pandey, R. (2011, October). Waste Workers and Scavengers of Kathmandu: Livelihood Assets, Vulnerability and Strategies in the context of Sustainable Livelihoods. *The Himalayan Geographers, 6*, 29-46.

Patil , P. V., & Kamble, R. K. (2017). Occupational health hazards in street sweepers of Chandrapur city, central India. *International journal of environment, 6*(2), 9-18.

Patil, T., & Raje, S. S. (2020, February). Occupational and social hazards among domestic solid waste collectors: a cross sectional study. *International Journal of Community Medicine and Public Health, 7*(2), 625-629. doi:http://dx.doi.org/10.18203/2394-6040.ijcmph20200439

PRIA. (2019, June). Lived Realities of Women Sanitation Workers in India. *Lived Realities of Women Sanitation Workers in India*. PRIA, India.

R, D., S , P., S, M., KM, A., S, M., & D, G. (2013, January 1). Impact of Health Awareness Intervention Among The Women Sweepers Working Under The Midnapore Municipality Of West Bengal, India. *Bangladesh Journal of Medical Science, 12*(1), 49-54.

R, D., S, P., S, M., KM, A., S, M., & D, G. (2013). Impact Of Health Awareness Intervention Among The Women Sweepers Working Under The Midnapore Municipality Of West Bengal, India. *Bangladesh Journal of Medical Science, 12*(1), 49-54.

Rahman, M. Z., Siwar, C., & Begum, R. A. (2017). Achieving sustainable livelihood through solid waste management in Dhaka city. *nternational Journal of GEOMATE, 12*(30), 19-27. doi:http://dx.doi.org/10.21660/2017.30.160618

Rajapaksha, T., Silva, S. D., Basnayake, B., Jayakody, L. N., R.T.K. , A., Siriwardena, A., . . . Pennie, K. (2017). Effectiveness of Health and Safety Training for Municipal Waste Collectors: A Case Study from Galle, Sri Lanka. *Tropical Agricultural Research, 28*(4), 324-333.

Rangamani, S., Obalesha, K. B., & Gaitonde, R. (2015). Health issues of sanitation workers in a town in Karnataka: Findings from a lay health-monitoring study. *The National Medical Journal of India, 28*(2), 70-73.

Ravindra, K., Kaur, K., & Mor, S. (2016). Occupational exposure to the municipal solid waste workers in Chandigarh, India. *Waste Management & Research, 34*(11), 1192--1195.

Rayen, L. P., & Nisee, J. T. (2016, April). A study on the status of sanitary workers in Tirunelveli corporation of Tamil Nadu. *EPRA International Journal of Multidisciplinary Research (IJMR), 2*(4), 63-72.

Rayen, L. P., & Nisee, T. J. (2016, April). A study on the status of sanitary workers in Tirunelveli Corporation of Tamil Nadu. *EPRA International Journal of Multidisciplinary Research (IJMR) , 2*(4), 63-72.

Salve, P. S., & Jungari, S. (2020). Sanitation workers at the frontline: work and vulnerability in response to COVID-19. *Local Environment, 25*(8), 627-630.

Salve, P. S., Chokhandre, P., & Bansod, D. W. (2019). Substance use among municipal solid waste workers in Mumbai: a cross-sectional comparative study. *Journal of Substance Use, 24*(4), 432-438. doi:https://doi.org/10.1080/14659891.2019.1595195

Sasikumar, K., & Krishna, S. G. (2009). *Solid waste management.*

Sathya, J., & Gayathri, J. (2020). A study on health conditions of sanitary workers in salem corporation. *Ecology, Environment and Conservation, 26*(1), 121-124.

Scoones, I. (1998). Sustainable Rural Livelihoods: A Framework for Analysis. Institute of development studies.

Serrat, O. (2017). The sustainable livelihoods approach. *Knowledge solutions: Tools, methods, and approaches to drive organizational performance*, 21-26.

Shankar, V. K., & Sahni, R. (2018). Waste pickers and the 'right to waste'in an Indian city.

Economic and Political Weekly, 53(48), 54-62.

Shrivastava, S. R. (2020, September 1). Improving the Health and Safety Standards of Sanitation Workers: Global Perspective. *Hamdan Medical Journal*, 178-179.

Spurgeon, A., Harrington, J. M., & Cooper, C. L. (1997). Health and safety problems associated with long working hours: a review of the current position. *Occupational and Environmental Medicine, 54*, 367-375.

Tamil Nadu Urban Sanitation Support Programme. (2020). *Compilation of Welfare Schemes for sanitation Workers.* doi:DOI: https://doi.org/10.24943/TNUSSPCWSSW0602.2021

Thakur , A., Kumari , S., Borker, S. S., Prashant, S. P., Kumar, A., & Kumar, R. (2021). Solid Waste Management in Indian Himalayan Region: Current Scenario, Resource Recovery, and Way Forward for Sustainable Development. *Frontiers in Energy Research, 9*, 609229.

Thorat, S. (2021, October). *Challenges and Policies to Address the Persisting Problems of Sanitation Workers in South Asia.* International Labour Organization.

Tohidimoghadam , A., PourSaeed, A., Bijani, M., & Samani, R. E. (2023). Rural sustainable livelihood resilience to climate change: A strategic analysis. *Environmental and Sustainability Indicators, 20*, 100292.

Uakarn, C., Chaokromthong, K., & Sintao, N. (2021). Sample Size Estimation using Yamane and Cochran and Krejcie and Morgan and Green Formulas and Cohen Statistical Power Analysis by G*Power and Comparisons. *Apheit international journal, 10*(2), 76-86.

VEERAMANI, S. (2018). The living conditions and working environment of municipal sanitary workers in Tiruvallur district Tamil Nadu. *The living conditions and working environment of municipal sanitary workers in Tiruvallur district Tamil Nadu*. University of Madras.

Vikblad, C. J., & Lekare, D. (2019). The livelihoods of municipal solid waste workers – sustainable or a vicious cycle of debt and vulnerability? A case study in Babati, Tanzania.

Xu, D., Deng, X., Guo , S., & Liu , S. (2018). Sensitivity of Livelihood Strategy to Livelihood Capital: An Empirical Investigation Using Nationally Representative Survey Data from Rural China. *144*, 113–131. doi:10.1007/s11205-018-2037-6

Yellaiah, O. (2023). Solid Waste Management in Telangana State A Study on Sanitary Workers of Karimnagar Municipal Corporation. *Solid Waste Management in Telangana State A Study on Sanitary Workers of Karimnagar Municipal Corporation*. Kakatiya University, Warangal.

Yuan, K.-H. (2005). Fit Indices Versus Test Statistics. *Multivariate Behavioral Research, 40*(1), 115-148.

Zhao, X., Huanga, S., Wanga,, J., Kaiserc, S., & Han, X. (2020). The impacts of air pollution on human and natural capital in China: A lookfrom a provincial perspective. *Ecological Indicators, 118* , 1-14.

Dr. Preethi Keerthi Dsouza
Research Guide

Bhagyashree R
Research Scholar